

The Iron Age

A Review of the Hardware, Iron and Metal Trades.

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A Well-Designed Machine Shop.

We present to our readers this week the plans of the new machine shop of the Dickson Mfg. Co., of Scranton, Pa., which possesses striking features as to construction, arrangement of tools, utilization of power, &c. The architectural designs for the building were made by Mr. I. G. Perry, of Binghamton, N. Y., while the constructive designs were in charge of the consulting engineer of the company, Mr. E. D. Leavitt, Jr., of Cambridgeport, Mass. The arrangement and distribution of the tools in the shop are the work of the superintendent of the company, Mr. Sidney Broadbent.

As will be seen from the accompanying plans, the building is substantially a modification of a one-story shop, and covers 223 feet by 100 feet of ground, of which space the machine shop proper occupies 196 feet by 97 feet, which, together with two galleries 25 feet wide, running lengthwise on two sides in the interior of the building, gives an available floor space of nearly 20,000 square feet. The remaining part of the ground on the Vine-street end of the building is occu-

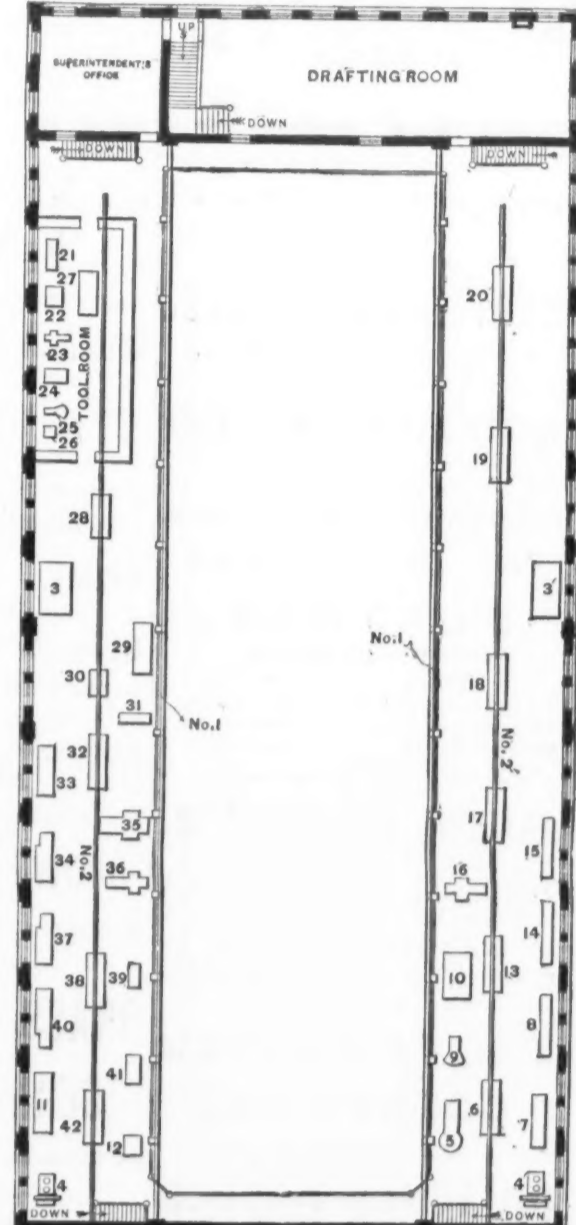
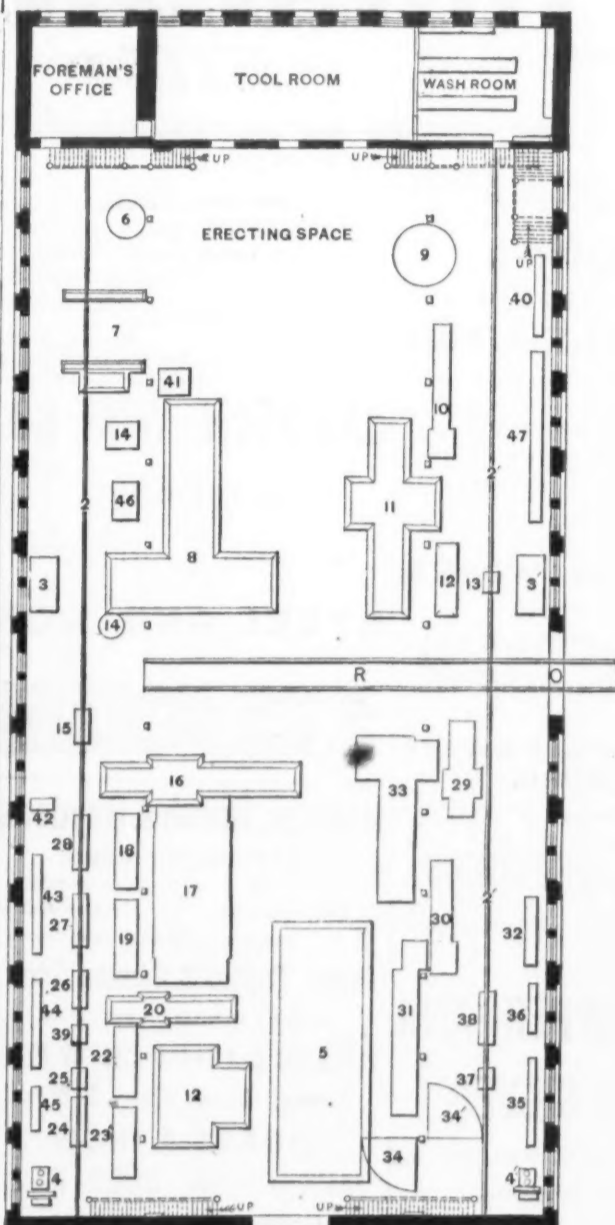
found, besides the foreman's office in the tower, a large room for the storage of heavy mandrels, tools and finished work, and a well-appointed wash-room for the men; from this room a passage leads to the sinks, which are arranged in a vault-extension under the sidewalk across the end of the building, and are heated by steam. On the second or main floor, the superintendent's office is in the tower, connected with the general offices and various foremen's offices by speaking tubes. On this floor is, further, a large room for the keeping of standard gauges, templates and models, a time-keeper's room and the main entrance to the yard and shop for the men. On the third story of this building is the office of the mechanical engineer, and a well-lighted, well-arranged and fire-proof room for the storage of drawings. This floor communicates with and is on the same level as the galleries, which are protected by a wire railing 4 feet high. Four stories of the tower are fire-proof rooms, with arched ceilings and double iron doors separating them from the rest of the building. Communication between the galleries is maintained by passages 5 feet wide at both ends of the building, and between the galleries and the ground floor by four stairways, one in each corner of the building, together with two elevators. These have a lifting capacity of 4000 pounds each, and are placed opposite each other and near the center of the building. The communication between the office part of the building and the shop, as well as with shop and streets, is shown on the plans. The walls are well and substantially built of brick, grouted solid with cement mortar, and the interior construction is of wrought iron. The iron columns supporting the galleries and central roof rest upon special foundations, and, as will be seen from the transverse section, the upper columns are open lattice and built out flaring, so as to afford support at once to the tracks of the traveling crane and the struts for the central roof, thus avoiding the necessity of using brackets. The roof construction, as well as that of galleries and floor, is plainly shown in the transverse section. Power is supplied to the shop by four small vertical engines, one for each line of shafting. They are two-cylinder 10 x 10 inch engines, making 200 revolutions per minute; working pressure, 75 pounds. The pair of engines on the lower floor are fitted with the regular D slide-valve, the pair in the galleries with the Townsend-Poor balanced slide-valve. The position of these engines is shown in the plans Nos. 4 and 4', and also in the transverse section. The two engines on the shop floor are used

to the 25-ton traveling crane, the other for driving the electro-dynamo.

The shop is lighted by electric lamps. The heating of the building is accomplished by

drafting room, whence it is distributed, at an expense of 4 pounds of back-pressure, through 10 coils of pipe and several radiators in various parts of the building. The

track R, as shown in the plan, being laid into and across the shop floor, thus affording, in connection with the traveling crane, convenient facilities for loading and unload-



FLOOR AND GALLERY PLANS OF THE DICKSON MFG. CO.'S SHOP.

back-pressure in this case is a trifling matter, considering the fact that the Dickson Mfg. Co., by burning coal waste exclusively, have been able to reduce the cost of their fuel to 35 cents per ton.

The following figures and particulars have reference to the floor and gallery plans shown in the accompanying engravings:

- | PLAN OF FLOOR. | |
|--|--------------------------------------|
| No. 5. Wheel Pit, 44 ft. long x 12 ft. wide. | No. 24. Vice Bench. |
| 6. Drill Press. | 25. Surface Plate. |
| 7. Horizontal Boring Machine. | 26. Vice Bench. |
| 8. 60 in. Double Face Plate Lathe. | 27. Vice Bench. |
| 9. 5 ft. Radial Drill. | 28. Vice Bench. |
| 10. 40 in. x 21 ft. Lathe. | 29. 48 in. x 48 in. x 12 ft. Planer. |
| 11. 10 ft. x 10 ft. x 25 ft. Planer. | 30. 51 in. x 13 ft. Lathe. |
| 12. Horizontal Boring Mill. | 31. 30 in. x 30 ft. Lathe. |
| 13. Surface Plate. | 32. 30 in. x 8 ft. Lathe. |
| 14. 60 in. Pulley Boring Mill. | 33. 60 in. Double Face Plate Lathe. |
| 15. 72 in. Slotter. | 34. and 34'. 8 ft. Radial Drills. |
| 16. 72 in. x 72 in. x 30 ft. Planer. | 35. 17 in. x 13 ft. Lathe. |
| 17. Floor Boring Machine. | 36. 16 in. x 8 ft. Lathe. |
| 18. 30 in. x 12 ft. Lathe. | 37. Surface Plate. |
| 19. 24 in. x 10 ft. Lathe. | 38. Vice Bench. |
| 20. 42 in. x 42 in. x 18 ft. Planer. | 39. Surface Plate. |
| 21. 16 ft. Boring Mill. | 40. 25 in. x 12 ft. Lathe. |
| 22. 18 in. x 10 ft. Lathe. | 41. 60 in. Boring Mill. |
| 23. 24 in. x 10 ft. Lathe. | 42. 12 in. Shaper. |
| | 43. 27 in. x 15 ft. Lathe. |
| | 44. 22 in. x 13 ft. Lathe. |
| | 45. 18 in. x 5 ft. Lathe. |
| | 46. 60 in. Pulley Lathe. |
| | 47. 26 ft. Shafting Lathe. |

As will be seen from the dimensions given, some of these tools are of extraordinary capacity and power.

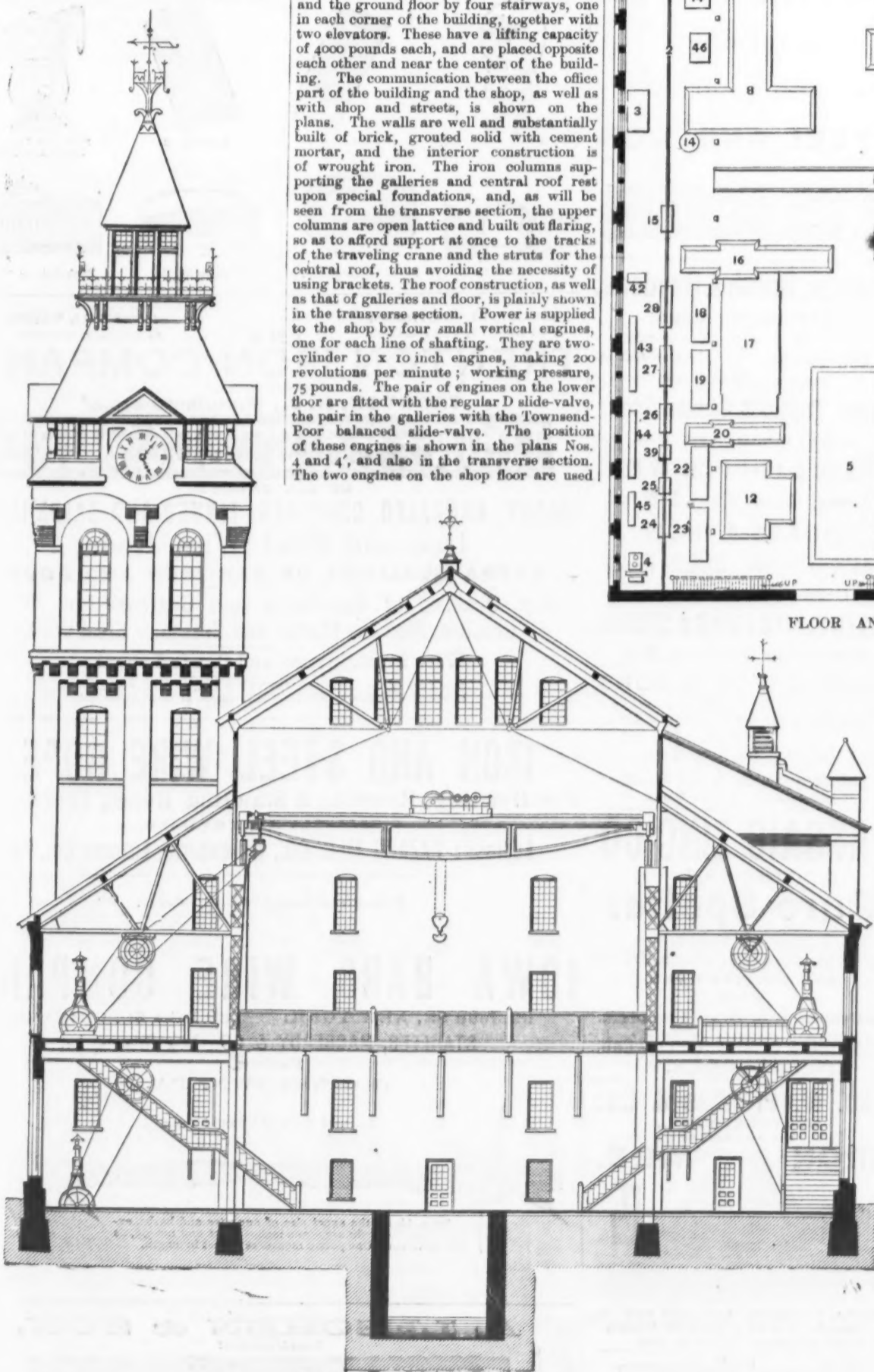
- | PLAN OF GALLERIES. | |
|--------------------------------|------------------------------------|
| No. 5. 36 in. Upright Drill. | No. 24. Universal Milling Machine. |
| 6. Vice Bench. | 25. 22 in. Drill Press. |
| 7. 16 in. x 7 ft. Lathe. | 26. Drill Grinder. |
| 8. 16 in. x 8 ft. Lathe. | 27. Vice Bench. |
| 9. 25 in. Upright Drill. | 28. Vice Bench. |
| 10. 12 in. Shaper. | 29. 15 in. x 6 ft. Lathe. |
| 11. 16 in. x 8 ft. Lathe. | 30. Centering Machine. |
| 12. Gear Cutter. | 31. Key-seating Machine. |
| 13. Vice Bench. | 32. Vice Bench. |
| 14. 16 in. x 8 ft. Hand Lathe. | 33. 15 in. x 7 ft. Lathe. |
| 15. 16 in. x 8 ft. Hand Lathe. | 34. 16 in. x 8 ft. Lathe. |
| 16. 2 x 3 x 26 ft. Planer. | 35. 6 ft. Planer. |
| 17. Vice Bench. | 36. 5 ft. Planer. |
| 18. Vice Bench. | 37. 16 in. x 8 ft. Lathe. |
| 19. Vice Bench. | 38. Vice Bench. |
| 20. Vice Bench. | 39. 20 in. Upright Drill. |
| 21. 12 in. Lathe. | 40. 16 in. x 8 ft. Lathe. |
| 22. 9 in. Shaper. | 41. 20 in. Upright Drill. |
| 23. 16 in. x 16 in. Planer. | 42. Vice Bench. |

The vice benches in the galleries are all portable. Communication with the yard is maintained by means of the large door O, the

ing. Protection against fire is secured in the construction, and by means of four stand-pipes, each having a hose connection upon both the main floor and the galleries. Each of these hose connections is furnished with 50 feet of hose upon a Teracher automatic hose-reel.

Mr. W. Barnet Le Van lately gave the Franklin Institute Society some interesting facts respecting the rate of speed which may be obtained from the use of the independent cut-off valve on locomotive engines. He compared the stationary engine of the past with the locomotive engine of to-day. The speed of the engine, he maintained, could be increased to between 70 and 80 miles an hour without any special change in the present construction of locomotives, and that a uniform speed of 60 miles an hour can be accomplished with the same engine now in use, with the addition of the independent cut-off valve. The steam, to be extended, must be cut-off sharply. "I would like to ask my tender-hearted friend," said an old gentleman in the audience, "how this increased speed bears on the sacrifice of human life." Mr. Le Van replied that the loss was proportionally less than in the old days when the stage coach was used as a means of travel. "In those days," he said, "the loss of life among people who traveled was one in 5,000, while at the present time it is one in 5,000,000."

The Society of Architects of Berlin have been investigating the subject of the change of some kinds of bronze to a black hue. It appears that one of the most notable statues in that city had become covered with a darkish layer, while an old cannon before the arsenal had retained its fine green color, the two having been exposed to the same atmospheric action. Upon being analyzed, the bronze of the cannon was found to consist of nine parts copper and one part tin; the bronze of the statue, however, exhibited a good percentage of zinc, and to zinc the change of color is regarded as due. In order to ascertain the facts in the case definitely, several copper alloys were subjected to the action of a copper solution. The result was that the alloys of tin and copper alone took the green color, while the alloys containing zinc became more or less black, according to the quantity of zinc they contained.



Cross Section and Elevation of Tower.

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steam, the exhaust from the steam-hammers and various engines in this and the other shops being run into a distributing reservoir located under the cross gallery opposite the

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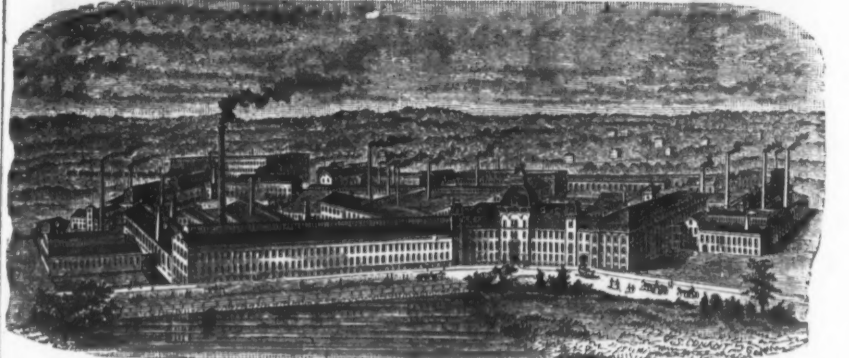
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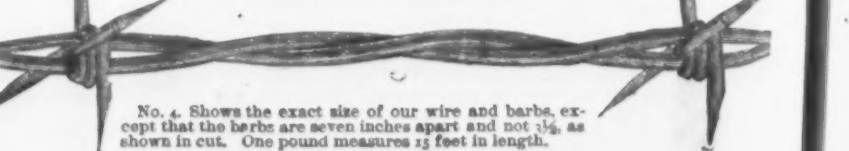
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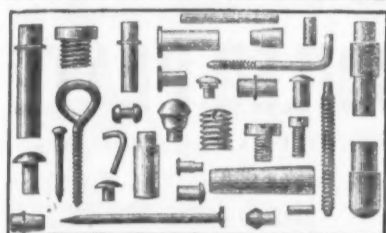
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The Amsterdam Exhibition.

Concerning the Amsterdam International Exhibition, which has been repeatedly mentioned in the columns of the press within the past few months, it is stated on official authority that the date originally fixed for the opening of the exhibition—namely, May 1—will be rigidly adhered to. So far as the space occupied by the different buildings and the space devoted to individual sections are concerned, the following figures may prove of interest: The area occupied by the exhibition building and by the gardens is, as nearly as possible, 3,000,000 square feet. The principal building occupies 550,000 square feet; the machinery annex, 150,000 square feet; the fine-arts gallery, 40,000 square feet, and the building erected for Dutch India 40,000 square feet. This amount of space is rather more than was covered by the buildings in Sydney in 1879, but is considerably less than was occupied by the various portions of the Melbourne Exhibition in 1880. The Amsterdam Exhibition will be small when compared with the vast collections in London in 1862, in Paris in 1867, at Vienna in 1873, at Philadelphia in 1876 and at Paris in 1878, but it will be very much larger than any exhibition which has been previously held in Holland.

The following is the list of the principal countries which will be represented at Amsterdam, and the area which they will occupy in the main building: France, 115,000 square feet; Belgium, 90,000; Germany, 70,000; Holland, 68,000; Great Britain, 36,000; Spain, 17,000; China, 14,000; Japan, 14,000; Austria, 13,000; Russia, 10,000; British India, 10,000; New South Wales, 6,000; Victoria, 4,000; Jamaica, Mauritius, Persia, Uruguay, Hayti, Brazil, Venezuela, Turkey, Greece and Tunis will have small courts. There will also be exhibitors from Italy, Switzerland, Portugal, Denmark and the United States. In the machinery gallery France will have 30,000 square feet; Belgium, 20,000; Germany, 15,000; Holland, 15,000; England, 15,000; and the United States, 10,000. Pavilions will be erected in the grounds outside the palace by the city of Amsterdam and by the city of Paris. It is intended to keep the exhibition open on Sundays, but it will be closed every evening at about 6 p. m., although access will be allowed to the gardens, which will be illuminated by the electric light till 10 p. m. The sum demanded for space varies from about \$5 to \$10 for about 10 square feet, and it is stated that the sum to be received for the rent of space will cover all the expenses for the erection of the exhibition buildings and leave a handsome margin for profit. In the second place, the cost of gold and silver medals—no inconsiderable item at previous exhibitions—will not have to be incurred, inasmuch as a successful exhibitor will only receive a diploma which will state the nature of the prize which has been awarded to his exhibit, while the medal to be issued will be uniformly bronze. The Government of the Netherlands has, however, taken proper precautions to prevent any undue favoritism on the part of the members of the juries. One-half the number of that body will be nominated by the various Ministers of State, and the other half by the foreign Governments which take part in the exhibition. Although exhibitors will have to incur a little more expense than at previous exhibitions, on the other hand the regulations as to the removal of goods are somewhat less stringent than has been usually the case hitherto. No charge will be made for watching, sealing permits, or other custom-house formalities required with respect to goods sent from abroad.

Electric Railways.

Among the numerous applications of electrical transmission of power, that to electric railways, first exhibited by Dr. C. W. Siemens at the Berlin Exhibition of 1879, attracted more than ordinary public attention. In this railway the current produced by a dynamo engine, fixed at a convenient station, and driven by a steam engine, or other motor, was conveyed to a dynamo placed upon the moving car through a central rail supported upon insulating blocks of wood, the two working rails serving to convey the return current. The line was 900 yards long, of 2 feet gauge, and the moving car served for carrying some twenty visitors through the exhibition each trip. The success of this experiment soon led to the laying of the Lichterfelde (Germany) line, in which both rails were placed upon insulating sleepers, so that the one served for the conveyance of the current from the power station to the moving car, and the other for completing the return circuit. This line had a gauge of 3 feet 3 inches, was 2500 yards long, and was worked by two dynamo machines, developing an aggregate current of 9000 watts, equal to about 12 horse-power. It has been in constant operation since May 16, 1881, and has never failed in accomplishing its daily traffic. A line about a quarter of a mile long, but having a gauge of 4 feet 8½ inches, was established by Dr. C. W. Siemens at Paris, in connection with the Electrical Exhibition of 1881. In this case, two suspended conductors, in the form of hollow tubes with longitudinal slit, were adopted, the contact being made by metallic bolts drawn through these slit tubes, and connected with the dynamo machine of the moving car by copper wires passing through the roof. Within the short period of seven weeks about 95,000 passengers were conveyed on this line.

An electrical railway six miles in length was recently completed in Ireland by Doctor Siemens, and in this instance the two rails, 3 feet apart, were not insulated from the ground, but were joined electrically by means of copper staples, and formed the return circuit, the current being conveyed to the car through a T iron placed upon short standards and insulated by means of insulate caps. At the present time the power for this railway is produced by a steam engine driving a shunt-wound dynamo of 15,000 watts or about 20 horse-power, but arrangements are now said to be in progress for the purpose of utilizing a waterfall of ample power by means of three turbines of 40 horse-power each. The working speed of this line was restricted to 10 miles an

hour, which was readily obtained, although the gradients of the line are decidedly unfavorable, including an incline of two miles in length having a grade of 1 in 38. Reports also reach us to the effect that the scheme for the construction of an electric railway under the Thames is now assuming a practical aspect, inasmuch as definite contracts have been entered into, both for the construction and the working of the line. The works to be constructed will comprise a double line of railway, and the approach to the line at either end will be by a short flight of steps. It is claimed that the working will be exceedingly economical, the power being obtained from fixed compound engines working expansively under a high pressure of steam. The cars will be constructed entirely of steel and wood, without any cloth or leather lining, similar in all respects to those manufactured for our street-railway cars. The speed will be limited to about 11 miles an hour.

The Storage of Electricity.

Prof. Henry Morton read a paper on the storage of electricity to the members of the New York Electrical Society, at the Stevens Institute of Technology, in Hoboken, recently. Edison incandescent lamps lighted the room, a two-horse-power Weston electric motor stood on the lecture table, and the lamps and motor were furnished with electricity from the Selou-Volekmar accumulators. Professor Morton briefly described the principles involved in the present methods of electrical storage. He then explained the structure of the Selou-Volekmar battery, which consists of plates, each made of a fine lattice-work of metallic lead, filled in with a porous mass, which was in each alternate plate either metallic lead or the black peroxide of lead. The experiments made by the lecturer showed that each cell in the battery would yield a continuous current of about 32 amperes for nine hours, with an electro-motive force of about 2.2 volts, a quantity of current sufficient to supply 44 of the Edison incandescent lamps of 16 candle-power, without employing more than 50 of the cells to secure sufficient electro-motive force to overcome the resistance of the lamps. Each cell weighed only 80 pounds when ready for work, so that for each light of 16 candles, burning one hour, 10 pounds of battery should be provided if it were used solely as a reservoir to contain the current required.

Experiments with the lights in the room were made to show that the battery in many cases would only be required to act as a regulator, simply taking up a temporary excess of the entire amount of electricity used, and providing for a temporary deficiency. By connecting the lights directly with a dynamo, its current was made to fluctuate so that the lights flashed up or faded according as the current was strong or weak. By connecting the dynamo with the battery, so that any excess of current could flow into it, or any deficiency be supplied by it, the lights burned perfectly steady. Touching on the question of using the storage batteries as a means of driving street cars, Professor Morton said that his measurements showed that each battery of 80 pounds weight contained energy equal to about 1,800,000 foot-pounds, or sufficient to take a "hothead car full of passengers across town, or from one end of the city to the other."

Right of a Contracting Party to Sue.—In the action of Charles G. Perkins against the United States Electric Light Co. for an injunction restraining the defendant from granting licenses or otherwise using the rights secured by several letters patent for inventions issued to the defendant, Judge Wallace, United States Circuit Court, rendered an opinion adverse to the plaintiff. Mr. Perkins was engaged in the service of the company for a term of years at a salary, under a written agreement, which, among other things, provided that the defendant should have the option of purchasing such inventions as complainant might make, while in the company's employ, pertaining to the art of lighting by electricity, at such price as might be agreed upon, or in case the parties were unable to agree upon the price, the sum was to be fixed by arbitrators. The agreement further provided that the defendant should pay all expenses of procuring letters patent and should hold all the letters patent except such as they purchased in trust for Perkins, to be assigned back to him upon his reimbursing the company for their expenses. The defendant elected to purchase several patents which are the subject of this suit, but the persons were unable to agree, and the complainant refused to accede to an arbitration, and now insists upon his right to revoke the contract and compel an assignment of the letters patent. Judge Wallace said that the patents had been issued directly to the company, they acquired the legal title, and there is no equitable principle upon which the complainant can found his right to relief.

Mr. Edison is said to have offered to Columbia College the collection of electrical instruments exhibited at Paris last year, on condition that the college shall establish a school of electrical engineering. The offer is now under consideration, but it is thought that the cost of maintaining such a school will be considerable, and the trustees consequently refrain from making any definite promises. Meanwhile, it appears, Mr. Edison has resolved to begin the systematic instruction of electrical engineers in a school to be established in this city. The extent of the business of the Edison Co. is so great that competent men cannot be obtained to take charge of the work, and a practical training school under such auspices will therefore, without doubt, be successful and valuable. As a matter of general interest we would state that electrical engineering departments have already been established by different institutions in the country, as, for example, the Massachusetts Institute of Technology, which will soon be ready to graduate its first class, Cornell University, and the Stevens Institute of Technology, Hoboken. The department in question at the latter institution is of comparatively recent origin, and it yet remains to be seen whether it will be productive of beneficial results.

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Blast Furnace Working.

Among other interesting papers recently read before the British Institute of Mechanical Engineers was one by Mr. Charles Cochran, on the working of blast furnaces, with special reference to the analysis of the escaping gases. The paper was intended to deal with the working of the blast furnace considered by itself, and Mr. Cochran's aim was to establish the fact that all economy in fuel consumed to make a ton of pig iron with any particular class or size of furnace is governed by three conditions: (1) The temperature of the air introduced into the furnace, (2) the temperature of the escaping gases, and (3) the quantity of carbon which can be maintained in the condition of carbonic acid, after it has once been transformed to this degree of oxidation from the carbonic oxide produced in the hearth. It was assumed at the outset of the inquiry that all the carbon of the fuel which reaches the hearth is transformed into carbonic oxide, and that, of the carbon so converted into carbonic oxide, a certain quantity is further converted into carbonic acid for the reduction of peroxide of iron—where calcine ironstone is used—into iron. This amount was arrived at by the chemical formula, $Fe_2O_3 + 3CO = Fe_2 + 3CO_2$, where 18 parts by weight of the carbon are needed to reduce 56 of iron. It was further assumed that the pig iron has 3 per cent. of carbon and 3 per cent. of impurities, containing, therefore, 94 per cent. of pure iron. Thus 20 cwt. of pig iron contain:

Pure iron, cwt.	18.8
Fixed carbon, cwt.	0.60
Impurities, cwt.	0.60
Total	30.00

The quantity of carbon needed for the reduction of this 18.80 cwt. of iron from its state of peroxide will therefore be:

$\frac{18}{56} \times 18.80 = 6.043$ cwt. This 6.043 cwt. of carbon, converted in this manner into carbonic acid, is the maximum quantity that can be so converted, and the amount of carbonic acid it produces is $\frac{11}{3} \times 6.043 = 22.154$

cwt. per ton of pig iron. While it is impossible for this weight of carbonic acid, if produced from this source, to be exceeded in the blast furnace, it is possible for some of it to be reconverted into carbonic oxide by the absorption of an equivalent of carbon, according to the chemical formula, $CO_2 + C = 2CO$. The value of the analysis of the escaping gases is that it affords the means of ascertaining the precise ratio of the two, and thence, after making all proper allowances and calculations, enables us to deduce the effective duty of the fuel employed in the furnace. Taking the simplest conditions first, it will be obvious that the quantity of heat carried into a blast furnace with the blast will depend simply on the actual weight and temperature of the blast itself. Thus, if 90 cwt. of air per ton of pig iron be passing into the furnace at a temperature of $900^\circ F. = 482^\circ C.$, this is equivalent in heat to 4.19 cwt. of carbon per ton of pig iron burnt into carbonic oxide inside the blast furnace; or if $1200^\circ F. = 649^\circ C.$, this is equivalent to 5.65 cwt. of carbon per ton of pig iron burnt into carbonic oxide. One point which cannot fail to strike any one is the gigantic stride which has been made in the economy of fuel in the blast furnace by the employment of heated blast. Thus, the heating of 145 cwt. of blast from the temperature of the atmosphere to $1500^\circ F. = 816^\circ C.$, would need the combustion of 11.43 cwt. of carbon burnt into carbonic oxide within the blast furnace, whereas this work is now done by what were wont to be called the waste gases passing from the tunnel head of the furnaces. In addition, this extra carbon would necessitate the introduction of cold air to burn it, and would so create a larger volume of gases passing away at the tunnel head. It is not surprising, then, that to make cold-blast iron we required 40 cwt. or more of coke per ton of pig iron made, and something like 10 tons weight of blast per ton of pig iron to be introduced into the furnaces.

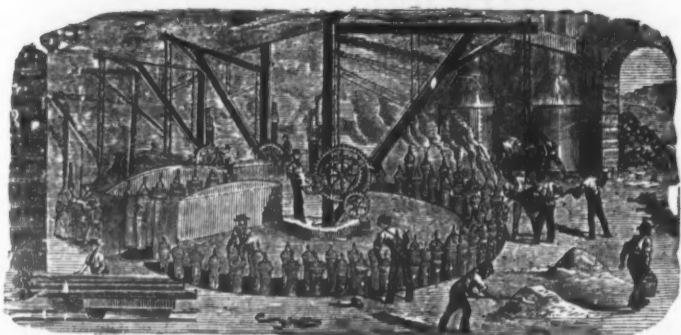
The second point proposed to be established was that economy of fuel consumed in a blast furnace is influenced by the temperature of the escaping gases, which must carry away a greater or less proportion of the heat actually generated in the furnace, according as their temperature is higher or lower. It must be obvious that if, by way of illustration, we suppose 5 tons of gases to escape in one furnace at a temperature of $700^\circ F.$, and in another at a temperature of only $350^\circ F.$, the saving in the latter case will be found to be about one-half the waste going on in the former. Mr. Gruner deduced a mean of 0.237 as the specific heat of the mixture. The mode of calculation to arrive at the heat carried away by the waste gases is simply to multiply the weights in cwt. by their temperature in Centigrade degrees, and again by the specific heat, or 0.237, and finally to divide by 2473, being the number of units of heat developed by the combustion of 1 cwt. of carbon into carbonic oxide. If furnaces are driving fast and the appliances for hoisting are inadequate, it may need two or three hours after a stoppage at meal times to restore the normal working of the furnace. One case is 1.50 cwt. for each ton of iron made during the period this abnormal condition of things was allowed to last.

The maintenance of carbon in the form of carbonic acid—the third point with which we have to deal—is perhaps the most important of the three under consideration; at any rate, it is the most subtle in its action, and has the most serious influence on the consumption of fuel in a blast furnace. Let it be remembered that 1 pound, 1 cwt., or 1 ton of carbon, burnt into carbonic oxide, will heat 2473 pounds, cwt. or tons of water from 0° to $1^\circ C.$, or 1 pound, 1 cwt., or 1 ton of water from 0° to $2473^\circ C.$ —if such a temperature were attainable by water. Let it be further remembered that 1 pound, 1 cwt., or 1 ton of carbon burnt into carbonic acid will develop 8080 such units—that is, will heat 8080 pounds, cwt. or tons of water from 0° to $1^\circ C.$, or 1 pound, 1 cwt., or 1 ton of water from 0° to $8080^\circ C.$ It will

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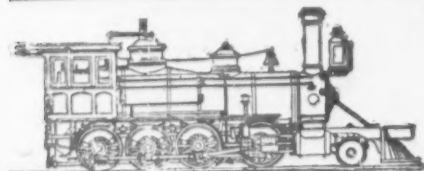
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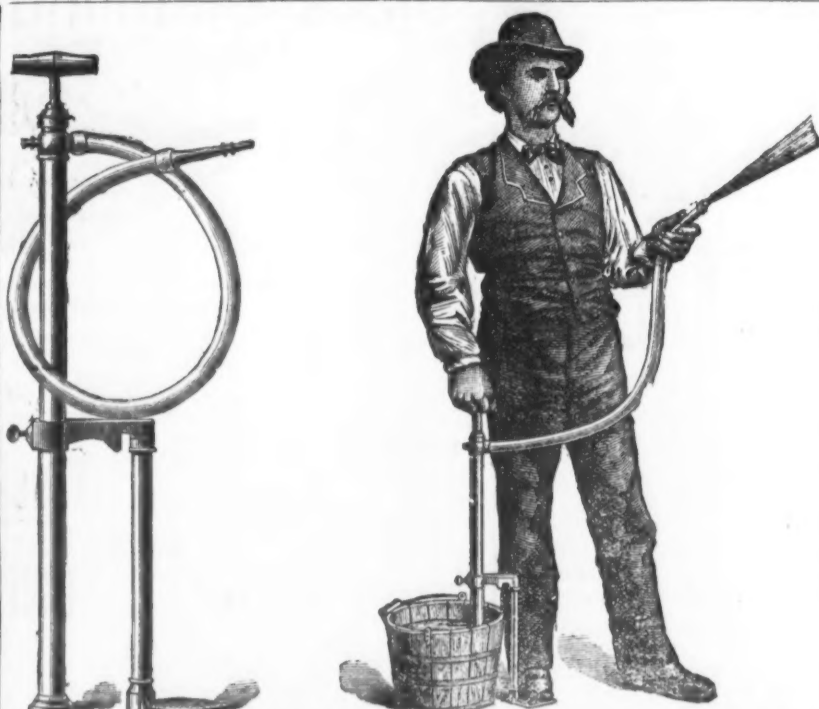


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then at once be seen how important it is, with regard to economy of fuel in a blast furnace, that we should insure the combustion of every unit of carbon, if possible, into the more highly oxidized gas called carbonic acid; and, furthermore, when once burnt into carbonic acid, that we should never allow it to pass back again into the condition of carbonic oxide if such a step be preventable. The conversion of 1 pound of carbon from carbonic acid into carbonic oxide can be accomplished only by the absorption of carbon, according to the formula: $CO_2 + C = 2 CO$; but in the process the heat lost is measured not only by the loss of the carbon so absorbed to convert carbonic acid into carbonic oxide, which carbon never reaches the hearth to be burnt by the blast, but also by the great difference existing between the heat equivalent of the carbon, as burnt into carbonic oxide and carbonic acid respectively; in other words, the carbon burnt in

the latter case is practically worth $\frac{8080}{2473} = 3.27$ times as much as the former. To make this point perfectly clear, we may say that it would require 3.27 pounds, cwt. or tons of carbon burnt into carbonic oxide to do the work of 1 pound, 1 cwt. or 1 ton of carbon burnt into carbonic acid. Hence it will readily be seen how important it is that, if any carbon in a blast furnace is once converted into carbonic acid, it should remain in that condition. For the sake of establishing a means of comparison as a basis for the voluminous tables by which the paper was accompanied, the standard of reference which was adopted was that of a series of ideal furnaces, consuming respectively from 10 cwt. to 34 cwt. of carbon per ton of pig iron produced, and rising by successive additions of 1 cwt. In all these ideal standards of reference the chemical action of the furnace was assumed to be perfect; so that 6.043 cwt. of carbon actually became converted into carbonic acid, and remained as such. In a blast furnace there is a further amount of carbonic acid furnished by the limestone; but this, it is to be feared, is converted wholly or almost wholly into carbonic oxide by contact with red-hot coke, and escapes at the tunnel head as such. Of this fact, however, Mr. Cochrane for the present took no cognizance, and assumed, for the purpose of this ideal furnace, that all CO_2 in limestone will leave the tunnel head in the condition in which it is evolved. It is proposed, in fact, to deal with the following calculations as if the CO_2 produced by reaction of CO on Fe_2O_3 were alone in question. Now, if 20 cwt. of carbon be the total consumed in the furnace, and if 6.043 cwt. be converted into carbonic acid, there will remain $20 - 6.043 = 13.957$ cwt. in the condition of carbonic oxide, and giving $13.957 \times \frac{7}{3} = 31.17$ cwt. of that of gas.

In like manner, should $1\frac{1}{2}$ cwt. of carbon be transferred, we still find that such a ratio of carbonic acid to carbonic oxide as 0.60 may still hold in a furnace of superior appliances, in which the consumption of carbon per ton of pig iron is only 20.9 cwt. The author maintained that it is impossible, from a mere chemical analysis of the gases emerging from the tunnel head of a blast furnace, to draw any reliable conclusion as to the working of the furnace itself. What, then, is the value of such analyses? Taken in conjunction with the consumption of carbon per ton of pig iron, and other collateral circumstances, analyses are invaluable; but by themselves they are misleading. Hence, in order to form a correct appreciation of the value of the analyses of the gases, it will next be necessary to make an approximate estimate of the quantity of air admitted to the blast furnace, and of the gases discharged therefrom, under the same successive conditions as to carbon burnt into carbonic acid in the ideal furnace, and its subsequent transfer to the condition of carbonic oxide by contact with red-hot coke. Mr. Cochrane submitted a table showing that the carbonic acid of the escaping gases is simply the amount due to a perfect reduction of all the peroxide of iron by carbonic oxide, plus that supplied by the $12\frac{1}{2}$ cwt. of carbonate of lime.

The oxygen needed to be supplied by the blast engine was taken at four-thirds of the weight of carbon to be burned—according to the chemical formula $C + O = CO$ —while the nitrogen was taken at 3.33 times the weight of oxygen. No account was taken of moisture in the air, as being a refinement of calculation outside his present aim. Another table showed the air passing into the furnace, and gases escaping therefrom, based upon the transfer of $\frac{1}{2}$ cwt. of carbon from the state of carbonic acid to that of carbonic oxide. The result of what has gone before was to enable us to establish a standard of reference for the working of any furnace under certain conditions of materials. To quote a single case: In November, 1881, the following analysis was made of gases escaping from a furnace of 20,454 cubic feet capacity at Ormesby Iron Works, Middlesbrough-on-Tees:

CO_2	= 13.42 by weight
CO	= 31.66 "
H	= 0.12 "
N	= 54.80 "
100.00	
The ratio $\frac{CO_2}{CO} = \frac{13.42}{31.66} = 0.424$	

The temperature of blast was $700^\circ C$; that of the gases was $340^\circ C$; the carbon in coke was 21.95 cwt.; the carbon in limestone was taken at 1.50 cwt.

These figures may correspond to several different conditions as follows: (1) To the condition of an ideal furnace consuming 34 cwt. of carbon per ton of pig. (2) Of a furnace in which $\frac{1}{2}$ cwt. of carbon has become transferred from the condition of CO_2 to CO , with a modified consumption of 32 cwt. of carbon per ton of pig. (3) Of a furnace in which 1 cwt. of carbon has been transferred from condition of CO_2 to CO , with a further modified consumption of 29.75 cwt. of carbon per ton of pig. (4) Of a furnace in which $1\frac{1}{2}$ cwt. of carbon have been transferred from the condition of CO_2 to CO , with the modified consumption of 27.5 cwt. of carbon per ton of pig. (5) Of a furnace in which 2 cwt. of C. have been

transferred, and the corresponding consumption is 25.25 cwt. of carbon per ton of pig. (6) Of a furnace in which $2\frac{1}{2}$ cwt. of C. (have been transferred, and the corresponding consumption is 22.67 cwt. of carbon per ton of pig. Obviously it would be impossible by the mere analysis of the gases to ascertain to which of these cases the analysis applied. But let it be known that at the same time that the analysis gave the ratio of CO_2 to $CO = 0.424$, the consumption of carbon on the ton of pig iron was 21.95 cwt. The conditions of ratio 0.424 and 21.95 cwt. indicate a furnace working with $2\frac{1}{2}$ cwt. or thereabouts of carbon transferred from CO_2 to CO , while the ideal furnace should only need 16 cwt. of carbon had no such transfer taken place. Obviously, if the limestone be calcined before entering the furnace, no carbonic acid will be evolved in the region of red-hot coke, and hence no absorption of carbon from this cause can take place. Again, to prevent the large pieces of ironstone from descending into red-hot regions before being perfectly reduced, they may be broken down to a size which will permit their reduction to take place in regions above those where nascent carbonic acid can do harm; or furnaces may be still further enlarged and pressure of blast increased, to enable the large pieces of ironstone, although unbroken, to be reduced to the core before entering the region of red-hot coke.

After considering, at considerable length, various questions connected with blast-furnace working, the author proceeded to point out, from our knowledge of the ratio of carbonic acid to carbonic oxide in the escaping gases, and of the consumption of carbon per ton of pig iron, in what way the combined sources of heat in the blast furnace are disposed of. To this end it would be requisite to premise that the melting of 1 cwt. of slag requires 550 calories, or heat-units, as stated by Mr. I. L. Bell and adopted by M. Gruner. Hence, assuming, as is approximately true in the Cleveland district, that 30 cwt. of slag are melted per ton of pig iron made, the quantity of carbon burnt into carbonic oxide

to effect its fusion would be $\frac{30 \times 550}{2473} = 6.67$ cwt. In like manner the decomposition of $12\frac{1}{2}$ cwt. carbonate of lime requires $\frac{12.5 \times 373.5}{2473} = 1.88$ cwt. Lastly, the loss by evaporation of water from the coke, the decomposition of water in the blast, and the losses by radiation, evaporation, &c., will amount together to about 3.44 cwt. more. The saving by use of primarily calcined lime under favorable conditions of materials and working may be: Carbon saved in furnace, 4.57 cwt.; deduct loss from diminished heat carried in by blast, less the allowance for diminished heat carried away by escaping gases, 1.43; net gain possible, 3.14. Seeing that this gain would be effected on the already low consumption of 16.60 cwt. of carbon per ton of pig iron, it seemed reasonable that a limit of consumption, in Cleveland blast furnaces, of 13.46 cwt. of carbon may yet be reached, or, say, about 15 cwt. of coke, containing 10 per cent. of ash and incombustible matter.

Mr. Cochrane's paper, as might naturally be expected, did not escape without discussion, and was vigorously attacked by Mr. I. Lowthian Bell, whose reputation as an authority on blast-furnace management is widely known. Mr. Cochrane's theory, as will have been noticed, is that if we know what weight of blast goes into a furnace, and its temperature, and what weight of gas and its composition left the top, we should be able to tell what goes on within the furnace. Knowing the weight and temperature of blast, we can tell from the tables submitted by Mr. Cochrane how much coal is the equivalent. Mr. Bell, among other things, argues that these tables are useless because the specific heat of air was taken by Mr. Cochrane as that proper to 32° , while it was different at 1000° . He, moreover, contends that the temperature in a blast furnace varies up to a certain point. Thus in a furnace with a capacity of 6000 cubic feet the temperature of the escaping gas at the top will be $900^\circ F$; in a furnace 11,500 cubic feet it will be 610° , in one of 15,000 feet it will be 595° , and in one of 25,000 feet it will be 587° , and practically no further reduction can be effected by enlarging the furnace. To this statement Mr. Cochrane replied that as a matter of fact, and not of opinion or theory, Mr. Bell was wrong, because the temperature at the top of his 35,000-foot furnace was only 300° . Among other statements made by Mr. Bell, carbonic acid (CO_2) cannot exist at a high temperature, dissociation taking place. Thus, if carbonic acid is in the first instance produced, it is at once broken up and we have $CO + O$. If the gases be taken to a locality of less temperature, union may again take place, and we shall then have CO_2 (carbonic acid). Whenever we require a higher temperature we must, according to Mr. Bell, discharge from the furnace unburned carbonic oxide. If we want a large quantity of heat at a low temperature, then we can burn the carbon to carbonic acid. In support of his statement, Mr. Bell pointed out that carbonic oxide will not burn in a coke fire in an ordinary domestic fireplace, but will burn freely to carbonic acid a little above the fire as soon as it has been cooled down. It is further cited, in illustration, that when steam is shut off from locomotives burning coke, a blue flame has been known to issue from the chimney, due to the ignition of the carbonic oxide coming from the coke. It has been hitherto held that the carbonic oxide burned under these conditions only because it was mixed with air, which it could not obtain in the fire-box after the draft caused by the escape of steam up the chimney ceased. According to Mr. Bell's explanation, however, the reason why combustion did not take place there was simply because the heat was too great. Our readers will perhaps remember that this very point has been repeatedly discussed by eminent authorities on the subject, their results coinciding with those arrived at by Mr. Bell. By way of illustration we would cite a series of experiments carried out some time ago by Professor Ledebur, in which known volumes of atmospheric air were passed through tubes containing incandescent charcoal, the temperature being varied to suit the requirements of the case. By means of suitable apparatus, which it is not necessary to describe in this connection, the

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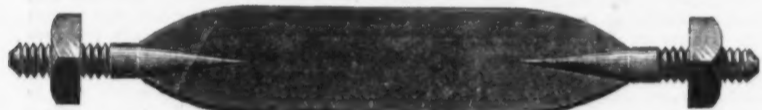
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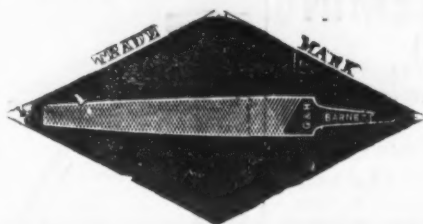
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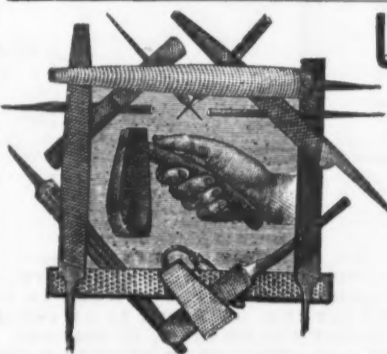
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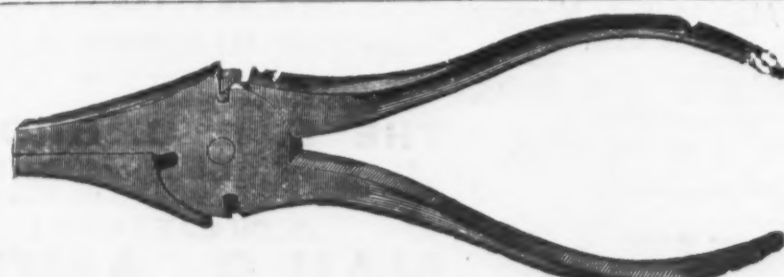
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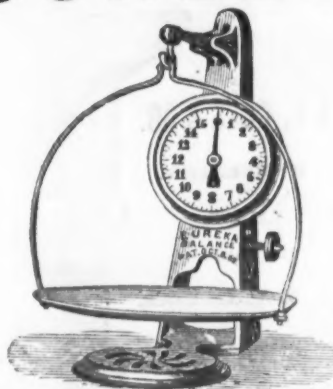
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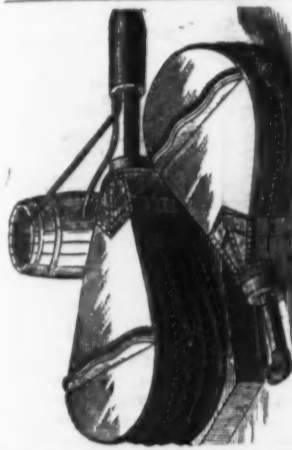
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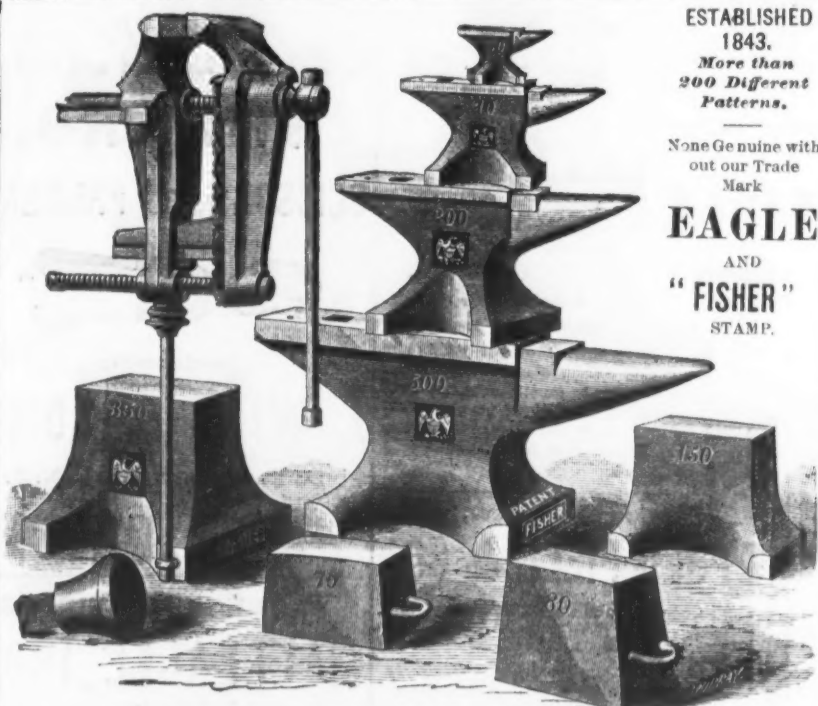
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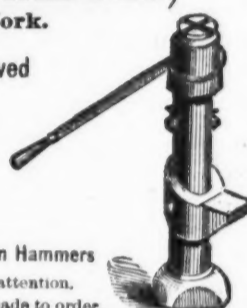
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JAPANNING.

BRONZING.

proportions of carbonic acid and carbonic
oxide were accurately determined, the re-
sults obtained being as follows:

Temperatures. Degrees C.	Carbonic Acid. Per cent.	Carbonic Oxide Per cent.
350	78.6	21.4
440	79.4	20.6
530	71.4	28.6
750	62.6	37.4
1100	1.3	98.7

These experiments, which, there is every
reason to suppose, were conducted with great
care, thus yielding trustworthy results, fully
bear out the position taken by Mr. Bell on
this question.

Returning to Mr. Cochrane, however, it is
but just to state that he ably defended some
of the salient points attacked by Mr. Bell,
and it is perhaps improbable that the matter
will end with the discussion. Either Mr.
Bell or Mr. Cochrane, it is thought, will read
another paper on blast-furnace economies,
and if such be the case, further interesting
developments will most certainly follow.

METALLURGICAL NOTES.

Separation of Metallic Ores From Their Gangue.

Mr. T. S. G. Kirkpatrick, of London, Eng-
land, has recently proposed a method of sepa-
rating metallic ores from their gangue, by
means of which he claims to produce very sat-
isfactory results. The ore, according to this
new method, is crushed by any suitable me-
chanical process, and is then separated by
sieves into three or more sizes, according to
the quality of the ore and the character of
the matrix. The crushing must be per-
formed in a dry state, and each parcel of
different-sized ore is then winnowed sepa-
rately by being passed through a machine so
constructed as to repeatedly present the ore
in thin, loose streams, falling into upwardly
directed currents of air which separate and
carry off the less dense and worthless partic-
les, leaving the metallic constituents of the
ore to be collected. It should be observed
in this connection that it is in some cases
advisable to allow a small amount of gangue
to remain in the final product, since the pres-
ence of such gangue is of less importance
than the loss of valuable mineral dust which
might be carried away to the exhaust by
continuing the process for too great a length
of time. In the case of some minerals the
lighter portion is more valuable, and in such
cases the principle of the invention is equally
applicable. The machine for removing the
ore is provided with means for receiving,
screening, feeding and distributing the
crushed ore for the purpose of submitting it
to the air current mentioned, and is con-
structed principally of a successive series of
vertically or upwardly-directed exhaust
passages, into which, as already described,
the ore is caused to fall in thin streams.

Thorium.

The metal thorium, the existence of which
was so long doubted by chemists, has re-
cently been isolated and its properties care-
fully studied by Mr. Nilson. The metal was
first discovered by the eminent Swedish
chemist, Berzelius, who detected a new
earth in a Norwegian mineral which he
called "thorite." The earth was called
"thoria," from which is derived the name
of the metal, thorium. Nilson's investigations
have modified to some extent the statement
of the properties of this rare metal as gen-
erally laid down in text-books. He succeeded
in isolating it by reducing the double chloride
of potassium and thorium by treatment with
dry chloride of sodium and metallic sodium.
This mixture was heated to a low red heat
in a wrought-iron cylinder furnished with a
piston to make it air-tight. By this means
the metal was obtained in a gray, lustrous
powder, which under the microscope was
seen to be composed of six-sided lamellar
crystals. The metal was found to be unaf-
fected in the air, even when heated to a tem-
perature of from 100° to 120° C. (= 212° to
248° F.). Heated to nearly redness, how-
ever, it burns with a bright light to snow-
white oxide. Burned in chlorine gas it
forms a white sublimable chloride, with the
evolution of heat and light. It is unaffected
by water and by hydrated alkalies. Diluted
sulphuric or nitric acid is stated to cause a
feeble evolution of hydrogen gas. Concentrated
sulphuric acid causes a slow formation
of sulphurous acid. Dilute hydrochloric acid
attacks and dissolves the metal readily, as
does likewise aqua regia. Thorium has a
specific gravity of 10.99 to 11.01. It is tetra-
valent, and its atomic weight is 232.40.

Basic Furnace Linings.

Kutscha, Oelwein and Mertens recommend
for furnace linings the use of the mineral
agalmatolite, occurring at Dilln, near Schem-
nitz, in Hungary. Its composition is: Silice
acid, 30.40; alumina, 52.68; iron oxide,
0.80; manganese oxide, 0.30; lime, 0.80;
magnesia, 0.39; sulphuric acid, 0.80; water,
11.88; alkalies, 1.50; total, 99.64. By
mixing two parts of burnt agalmatolite with
one of the raw material, and moistening the
mass with water, the mixture may be
pressed into briquettes, which, on burning
at a white heat, become hard and adhesive,
and do not shrink. For the preparation of
basic linings it is proposed to add to lime
or dolomite a flux in such proportion that
the mixture after 12 hours' burning at a white
heat forms a slag, which is pulverized and
worked up with suitable basic agents.
For the manufacture of such basic refrac-
tory masses, dolomite of the following com-
position is used: Silice acid, 0.7; alumina,
0.5; iron oxide, 0.6; lime, 31.5; magnesia,
20.0; carbonic acid, 46.7. Mixed with 12
per cent. of talc of the composition: Silice
acid, 62.0; magnesia, 31.0; iron oxide, 2.0;
water, 5.0. The mixture is formed into
bricks, heated for 12 hours at a white heat,
pulverized, treated with from 5 to 8 per cent.
of tar, from 3 to 5 per cent. of pitch or from
5 to 10 per cent. of rosin, pressed while hot
in heated molds and burnt at a high tem-
perature. Bollinger recommends the use of a
mixture of asbestos, chrysotile and magne-
sium chloride for the preparation of refrac-
tory basic linings.

Meteoric Iron.

One of two blocks of meteoric iron in the
possession of the British Museum, and found

in Victoria, Australia, in 1854, was recently
studied from a chemical and mineralogical
point of view by Dr. W. Flight, of that mu-
seum. At the time of finding the mass,
which weighs somewhat over three tons,
only a small portion projected along the soil,
the remaining portion being imbedded in
tertiary sandstone overlying basalt. Dr.
Flight states that the entire mass consists of
metallic minerals and is destitute of silicates.
In the course of the analysis the iron was
found to contain numerous minute brittle,
strongly magnetic, apparently square prisms,
which form about 1 per cent. of the mass.
These prisms were slowly and with difficulty
acted upon by hydrochloric acid, but readily
dissolved in nitric acid. Scales were ob-
served lying on the faces and between the
plates of iron crystals, being in the form of
equilateral triangles, and having the thick-
ness of stout writing-paper; they were,
moreover, pliant, strongly magnetic, and of
a pure white color. Analysis showed the
mass to contain 70.138 per cent. of iron and
29.744 per cent. of nickel, and Dr. Flight
proposed for it the name Edmondsonite.
The analysis of a brittle, magnetic powder,
which easily dissolved in nitric acid, gave
the formula (Fe, Ni) P. A large brass-col-
ored, oblique crystal, showing perfect basal
cleavage, dissolved readily in aqua regia, but
was only slowly acted upon by hydrochloric
or nitric acid alone, and gave, on analysis,
the formula (Fe, Ni) P. Another crystal
which was found was apparently a square
prism, having brilliant metallic sides, with a
dark, almost black, center. Its analysis
gave the formula (Fe, Ni) P. Graphite oc-
curred occasionally in this meteorite, both in
nodules and in plates. The iron was also
examined for occluded gases, and carbonic
acid, carbonic oxide, hydrogen, nitrogen and
marsh gases were found.

Temperature Tests With Boiler Plate.

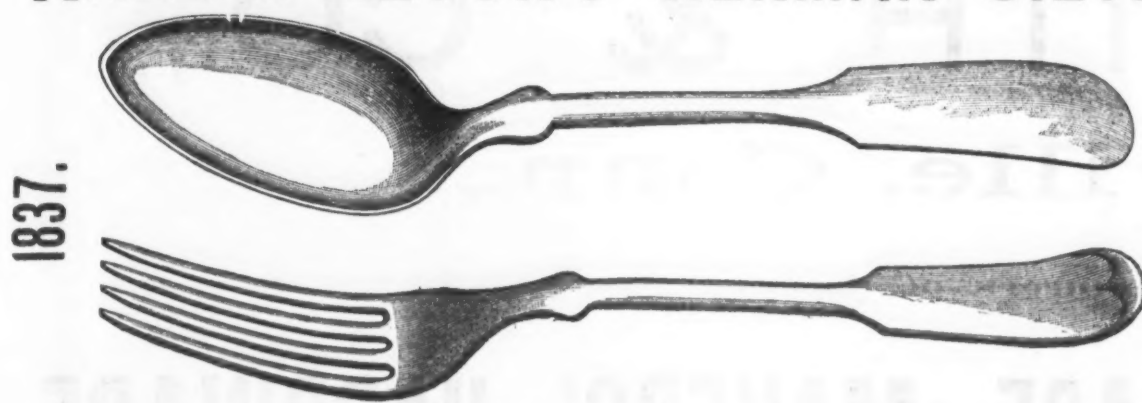
The variation in tensile strength of iron
and steel at different temperatures is well
known, and some interesting as well as im-
portant experiments have been made show-
ing the relation of this fact to boiler plate.
To measure the temperature of the test
piece and maintain it, the breaking point in
each sample was made by taking a piece of
the plate planed with parallel sides about
one inch wide, and in the middle drilling a
hole one-fifth of an inch in diameter, this
hole being well filled with an amalgam plug
of known melting point. This sample was
fixed in the testing machine, and a large
blow-pipe flame applied, covering the whole
width of the piece. Then, as soon as the
amalgam became semi-solid on the side
opposite to that on which the flame was
directed, the temperature was kept uniform
until the strain was carried to the point of
rupture. Among the results of this series
of experiments were some which were
hardly to be expected, but the reliability of
which cannot be doubted. Thus, charcoal
boiler plate made from the pile in the ordi-
nary way was first tested cold; at 300°
C., or 572° F., it showed a percentage of
gain in tensile strength of 13.93, and at
500° C. or 932° F., a gain of 18.02 per cent.
An exceptionally soft piece of Siemens-
Martin steel gained 21.03 per cent. at 300°
C., and only 17.86 per cent. at 500° C. An
ordinary soft crucible steel, such as is used
for boilers, gained 8.23 per cent. at 300° C.,
and 7.18 per cent. at 500° C.; a rather
harder specimen of crucible steel, but not
quite hard enough to temper, showed a loss
of 1.4 per cent. at the higher temperature,
and a small gain—5.62 per cent.—at the 300°
C. test. The various results thus obtained
show an increase in tensile strength in all
the samples tested at 300° C., a continued
increase at 500° C. in the charcoal-piled iron,
but a falling off in the Siemens-Martin and
crucible steel in proportion to the probable
amount of carbon.

NEW PUBLICATIONS.

MECHANICAL DRAWING SELF-TAUGHT. By Joshua
Ross; 320 engravings; 31 pages; 6 x 9 inches.
Published by Henry Carey Baird & Co. Price, 4s.

The author says his object in writing this
book was to provide the beginner with in-
structions which would enable him to learn
how to make simple mechanical drawings
without the aid of an instructor. Interest
in the subject has been increased by giving
such examples as the machinist meets in his
everyday workshop practice. The chapters
on the preparation and the use of instru-
ments are practical and contain many use-
ful hints. The geometric drawing is what
is always required in works of this kind.
Some of the matter relating to shadow lines
and shading is exceedingly good, and we
think the chapter might have been extended
to advantage. In the chapter on bolts, nuts,
&c., there is a variety of practical hints
that the novice taking up the book without
an instructor will find decidedly useful, and
we might say the same of all parts of the
work. There are hints, details and sug-
gestions which are particularly serviceable
to those who have no instructor to aid them
in their early attempts to represent objects
by what is known as "mechanical" draw-
ing. We note one thing that is certainly a
good feature, namely, the presentation of
examples from actual machinery rather than
ideal constructions which are unlike any-
thing that the draftsman is likely to find in
actual practice. We are sorry to say, how-
ever, that in many of them the omission of
shade lines is a serious defect, which is some-
what exaggerated by insufficient care in
printing. The enormous increase in the ac-
curacy and ease with which a mechanical
drawing with proper shade lines can be read
is ample justification for the practice of in-
troducing them and for the trouble which is
necessary in putting them in. We have
heard a great many discussions of this ques-
tion of shade lines, in which much has been
said both for and against, but we do not now
call to mind a single reasonable objection to
their use, nor do we think one has ever been
advanced. In presenting these examples of
actual work the author has departed from
the ordinary practice, since most of the work
introduced is recent, and all of it good. The
drawings have in a large number of cases
been dimensioned, and in this way the
student is enabled to get from the book some
of the advantages which he would have in
the drawing-office.

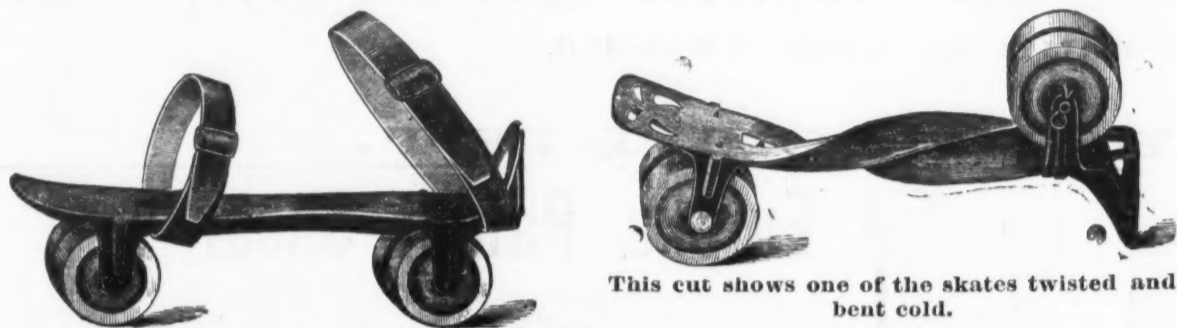
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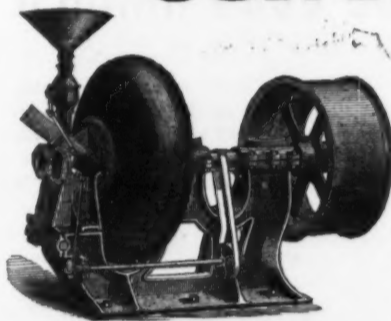
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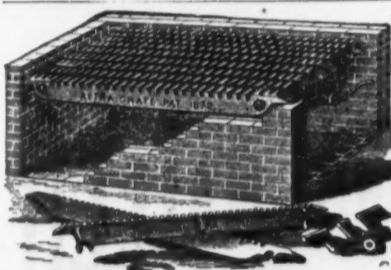
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The stockholders of the corporation heretofore known as

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at their annual meeting, held April 19th, 1883, voted to accept the authority given them by an act of the Legislature of Connecticut, to change the title of the corporation to

The Yale & Towne Mfg. Company,

by which latter name it will hereafter be known.

For reasons not necessary to enumerate, it has been found expedient to effect a subordinate organization, under the general laws of the State, bearing the old title of The Yale Lock Manufacturing Company, and also a similar organization entitled The Weston Crane Company. In like manner The Emery Scale Company was organized during last year. The stock of all these subordinate companies is owned and controlled by the parent company, now known as

The Yale & Towne Mfg. Company,

and, although the several subordinate organizations will be permanently maintained, for purposes relating to the ownership of patents and other franchises, the business of all will be conducted by The Yale & Towne Manufacturing Company, in its own name and for its own account, so that all communications should be addressed to the latter name.

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CUTTING TOOLS WORKED BY HAND AND MACHINE. By Robert H. Smith, Mason's Science College, Birmingham. Size, 4 1/2 by 6 1/2 inches; 224 pages. Published by Cassel, Fetter & Galpin. Price, \$1.50.

This is a book that the machinist and tool-maker will take up with singular satisfaction, even though its principles and practices are at variance with what he considers correct. The method of approaching the subject, the directness of the statements, and the care that has been taken in illustration, are all pleasing. It is not, as might at first be supposed, merely a little book on hand tools, but embraces the whole subject of cutting in metal by machinery. The first chapter, relating to all sorts of wood tools, bearing tools, planes and their guidance, is, of course, largely made up from Holtzapfel. Some little attention is given to wood-working machinery, but the author, after 50 or 60 pages of preliminary work, at once takes up the subject of tools for metal cutting, and gives details of standard English machine tools of all kinds. Among the principal machines illustrated are milling, planing, shaping and slotting machines, screw-cutting, surface, face and wheel lathes, head stocks, milling machines and radial drills. No small amount of attention is given to tools for cutting iron, the methods of holding them, influence of feed upon the pressure necessary with a given feed, and other matters bearing upon the power required to do a certain amount of work. Tables are given showing the pressure on the tool-point with a certain depth of cut, speed of revolution and feed. These tables cover cast and wrought iron and steel. Of the value of these tables little can be said, as may be judged from a criticism which we publish elsewhere. There are also graphic illustrations covering the same ground. The author refers in a very happy way to some of the mathematical papers published in Holtzapfel's works, saying of them that they are singularly apt illustrations of the extremely vicious results occasionally met by mathematicians who interpret nature by algebraic formulas alone, without the aid of experiment. The author himself evidently believes that mathematical theory is the only possible way of ultimately describing fully developed scientific knowledge, but he also believes that it is worse than useless to dabble in mathematical theory before becoming thoroughly familiar with all the facts of the subjects obtainable by experiment and observation. Unfortunately, the experiments in this case are hardly satisfactory.

Scientific Proceedings of the Ohio Mechanics' Institute.

This is a monthly which, as its name indicates, is a report of the proceedings of the Ohio Mechanics' Institute. It is published by the Publication Committee, at Cincinnati, Ohio. It has an attractive table of contents and will be found valuable by a large circle. The publication is now in its second year. It is well edited and its condensations are very creditably made.

Coal in Texas.

In Southwestern Texas all fuel is scarce. Mesquite wood commands from \$3.50 to \$5.75 per cord, and 1 ton of good coal is estimated as equivalent in calorific power to from 1 1/2 to 2 cords of this wood. Such coal has been heretofore used in the above-named section was brought from Indian Territory or from Gulf ports, having been carried to the latter by water. Lately the Rio Grande and Pecos Railway has been built, and on the coal lands along the line of the road belonging to the company several mines are now opened about 25 miles west of the city of Laredo. The coal mines in the Indian Territory are 625 miles distant from Laredo, the present terminus of the road, and the outlet for its coal supply. With the exception of an inferior lignite, no coal is known to exist in Texas nearer to these coal fields than 400 miles in a direct line, and this deposit (the Brazos coal field) is undeveloped. A large market is therefore open to the fuel obtained from the beds in the Rio Grande Valley. It is estimated that the present demand for coal at Laredo would be for supplying 1000 miles of railroad in Texas, 48,000 tons; for supplying Laredo, San Antonio and adjacent country, 12,000 tons, or a total of 60,000 tons per annum. In this estimate a probable demand from Mexico for railroad and metallurgical purposes, or a coal supply to the Gulf ports, which now obtain this fuel by vessel, have not been considered. The 60,000 tons are a safe basis for the present requirements of Southwestern Texas, but the rapid advance of the railroads and increase of manufacturing interests and of population, it is believed, will cause a largely augmented and constantly increasing demand.

The two drifts on the railroad company's land known as the Hunt Mines are run parallel into a hill; one is 365 feet, with a cross-cut 277 feet, and the other 542 feet in length. They can, as at present arranged, produce 130 tons per day, and this output can be doubled with a limited expenditure. The thickness of coal in the Hunt Mine is from 18 to 26 inches. Test pits and exposures indicate a persistence of the coal veins and the existence of others. Three workable veins of coal are believed to exist on the property, and a large working shaft is now being sunk with a view of cutting all of them. The two seams below the present workings show in the test pits 24 inches and 50 inches of coal respectively. The high price now paid for mining coal (\$2 per ton) is made necessary by local conditions, scarcity of skilled labor, &c. By increasing the output, the cost per ton for ventilation, handling, superintendence, &c., will be largely reduced, and by improved methods in mining from the present openings the coal should be delivered on cars at a cost not to exceed \$2 per ton. The coal sells at Laredo at retail at \$6 per ton, and as wood is sold in large quantities at \$3.50 per cord to railroads, it is not too high comparatively. Coal brought from Pennsylvania and the Western States sold January 1 at New Orleans at from \$4 to \$5.50 per ton for bituminous, and \$7.25 to \$8 for anthracite, so that at \$4.50 per ton, wholesale, coal at Laredo would be in great demand in a large area.

The coal shows a marked absence of sulphur, and burns freely. For the present,

Mexico offers a market for from 15,000 to 20,000 tons per annum, and as the railroads are extended this will be constantly augmented, so that the demand would seem to be greater than the estimate above given. At present the Rio Grande and Pecos Railway is constructed from Laredo to the Santa Tomas mines, and has over 29 miles of track laid with heavy iron rails on good sawed sills; the bridges are excellent and the road well made. There are good water service and excellent terminal facilities, and substantial turn-table, houses, &c., are now in course of construction. The Santa Tomas Mine is not on the Rio Grande and Pecos Railway Co.'s land, but is leased by the company. This opening is a drift some 800 feet in length on a 30-inch vein of superior cannel coal. Mining here now costs \$1.50 per ton, but it is expected to materially reduce this price. The Rio Grande and Pecos Railway is projected along the valley of the Rio Grande from its mouth to the confluence of the Pecos River, thence up the valley of the Pecos. It is proposed to complete at once the division of 120 miles from Laredo to Eagle Pass, so as to have outlets for the coal found along the line of the railroad.

Manufacture of Leather Belting.

The particulars necessary to a full understanding of the manufacture of leather belting are given in an interesting pamphlet issued by the Page Belting Co., of Concord, N. H. The heavy green hides purchased exclusively for belting are stored in large piles in an apartment allotted to that use—some packed in salt, while others, which have been through the salting operation, await, in a cured condition, their turn to enter upon the first process of the manufacture. A careful sorting of the hides is made, and any which may not be suitable for the purpose are thrown out. This storage apartment opens directly into the "beam house," as it is called, where the hides are prepared for the tan liquors. The hides having been soaked in vats, the flesh left on them by the butcher is removed, and they are put into vats filled with a weak solution of lime. From these weak limes the hides are advanced at regular intervals into increasingly stronger limes, being turned by reel out from one vat into the next, the hides being attached to one another and forming a sort of belt. When they have passed through the entire row of lime vats, they are taken from the last and strongest and thrown over beams, and the hair is removed. After being "unhaired" they are again carefully sorted, in order that any green hides supposed to be fit, but which the process proves to be unfit, for belting, may here be rejected, and so only belting hides pass into the tanning liquors. After this, various millings and soakings take place for the purpose of preparing the hides for the removal of the lime, which is finally effected by machinery.

The hides are then carried to the tanning department. Somewhat independent of this department, and in other rooms, the bark is steeped or leached, the liquors being prepared for use and stored in large reservoirs, where they are cooled and mixed to any required strength. Each stage of the process requires a different degree of strength. From the tanks before mentioned the liquors flow into the head vats of each section, the vats being so arranged as to permit the liquors to flow slowly down the sections to the foot-pits, where the green hides are placed on coming from the "beam house." At regular intervals the hides are advanced or carried along the section until they finally pass through and leave the "head" vat. Consequently these eight vats in each section are filled with leather in as many different conditions in the process of tanning, and also with liquor of as many different degrees of strength. From the "foot" vat the liquor, from which all its tanning properties have been extracted, passes to a large underground tank, where by machinery it is pumped off for another use. The partially tanned hides now, in another form, go into various liquors where a similar uniform and systematic course is pursued. The advance which has been made in the methods employed in this industry is strikingly illustrated by the modern bark mill. Among its advantages are the uniform quality of the ground bark and the speed with which the work is done. No further handling of the bark takes place, as it is conveyed by machinery to the points where it is used. In the general process of currying the first stage is that of scouring, which consists in treating the leather by a powerful machine until the grain is soft and smooth, and bodies that would be injurious to the finished leather are removed. After the leather has been stuffed or greased it is put into the dry-rooms specially fitted for the purpose. At the proper time it is "set" by the scouring machine, after which the drying process is completed, and the leather is packed in large piles to secure a certain desirable condition. When this condition has been obtained the leather is stretched. By the stretching machine the moistened leather is subjected to a uniform and powerful strain. When the proper strain has been secured, and the leather fastened so that it will not give back, that which appears to be the top of the machine is removed to a dry-room, and another set of clamps placed on the machine for like filling. So the process is rapidly repeated until a large number of these clamps or stretchers are stored in suitable dry-rooms, where they remain until the leather is perfectly dry. Then, when taken from the clamps, it completely retains its stretched condition. The last process before entering what is known as the "belt shop" is the finishing or polishing of the surface.

Of the actual work of making the belt, which is performed in the "belt shop" proper, there are several stages. On coming into the room the leather is straightened on one side and then stripped very rapidly through a gauge into various widths as wanted. After this process the strips are carefully examined, and the various widths are packed by themselves and stored until required for the next process, when they are taken to the fitting-tables and properly divided to various rolls, so that uniform thickness in each roll shall be secured. The waste is then cut off, and the strips so prepared

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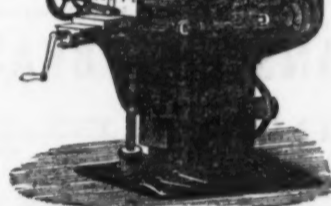
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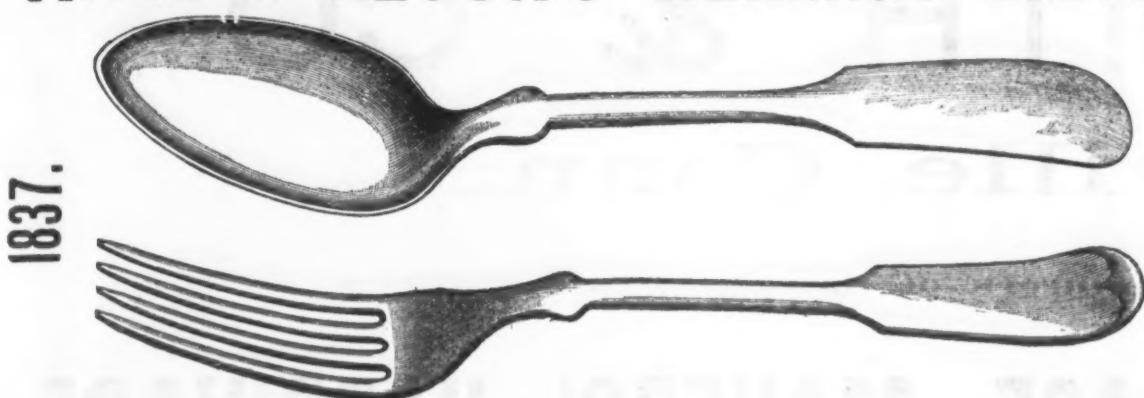
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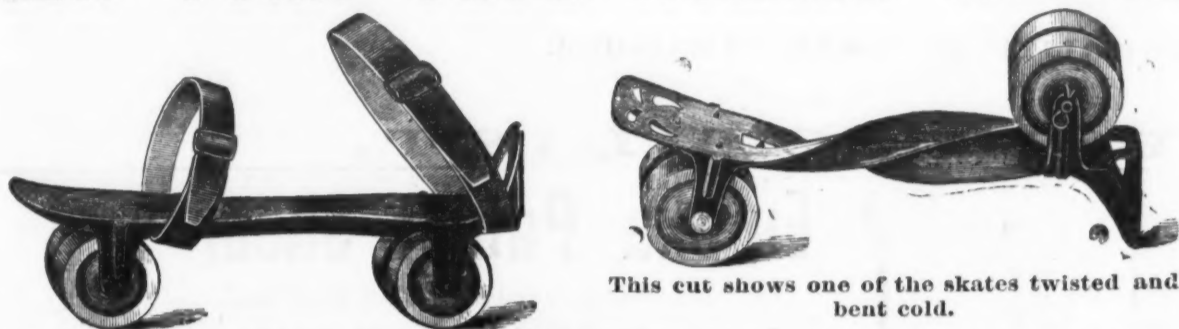
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In addition to Spoons of this well-known brand, we are now prepared to furnish Forks of the same quality. We GUARANTEE these goods to be SOLID and of UNIFORM quality throughout, with no coatings to wear through or flake off, and with no liability to RUST.

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NEW YORK CLUB ROLLER SKATES.



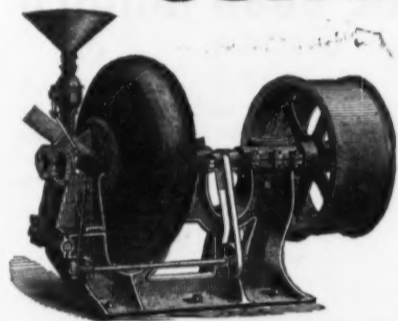
The lightest, easiest working and most durable Roller Skate ever made. The frames are made from a fine quality of decarbonized steel, and cannot possibly be broken in using. The heel support is preferable to the ordinary one of leather, as it cannot wear through. Besides these, the skate has many other advantages, and the price is low as compared with others. Patented June 21, 1881.

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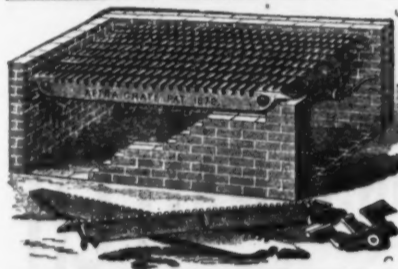
For reducing to an impalpable powder all kinds of hard and brittle substances, such as QUARTZ, EMERY, CORUNDUM, GOLD AND SILVER ORES, BARYTES, COAL, OCHRE, MANGANESE, IRON ORES.

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It is simple and not liable to get out of order. Revolving Shell being constructed of Siemens-Martin steel, and all parts mechanical in design and of first-class construction. Weight, 5,500 lbs. heaviest piece, 1,500 lbs. It will pulverize 7 to 10 TONS IN 10 HOURS with 30 H. P.

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BAILY PORTABLE HOIST.



Warranted double the power and not one-half the price of other hoists. As a proof of the above, I will give them 30 days on trial. Send for catalogue and price list.

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MANUFACTURERS, ENGINEERS AND MACHINISTS.

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HENRY R. TOWNE, President.

Incorporated 1868.

Principal Office & Works, STAMFORD, CONN.

OWNING AND OPERATING

THE YALE LOCK MANUFACTURING CO.,

THE EMERY SCALE CO.,

THE WESTON CRANE CO.

The stockholders of the corporation heretofore known as

The Yale Lock Mfg. Company,

at their annual meeting, held April 19th, 1883, voted to accept the authority given them by an act of the Legislature of Connecticut, to change the title of the corporation to

The Yale & Towne Mfg. Company,

by which latter name it will hereafter be known.

For reasons not necessary to enumerate, it has been found expedient to effect a subordinate organization, under the general laws of the State, bearing the old title of **The Yale Lock Manufacturing Company**, and also a similar organization entitled **The Weston Crane Company**. In like manner **The Emery Scale Company** was organized during last year. The stock of all these subordinate companies is owned and controlled by the parent company, now known as

The Yale & Towne Mfg. Company,

and, although the several subordinate organizations will be permanently maintained, for purposes relating to the ownership of patents and other franchises, the business of all will be conducted by **The Yale & Towne Manufacturing Company**, in its own name and for its own account, so that all communications should be addressed to the latter name.

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NEW YORK OFFICE, - 62 READE STREET, PHILADELPHIA OFFICE, - 507 MARKET STREET,
BOSTON OFFICE, - 224 FRANKLIN STREET, WESTERN OFFICE, - 64 LAKE STREET, CHICAGO.

CUTTING TOOLS WORKED BY HAND AND MACHINE. By Robert H. Smith, Mason's Science College, Birmingham. Size, 4 1/2 by 6 1/2 inches; 224 pages. Published by Cassel, Pette & Galpin. Price, \$1.50.

This is a book that the machinist and tool-maker will take up with singular satisfaction, even though its principles and practices are at variance with what he considers correct. The method of approaching the subject, the directness of the statements, and the care that has been taken in illustration, are all pleasing. It is not, as might at first be supposed, merely a little book on hand tools, but embraces the whole subject of cutting in metal by machinery. The first chapter, relating to all sorts of wood tools, bearing tools, planes and their guidance, is, of course, largely made up from Holtzapfel. Some little attention is given to wood-working machinery, but the author, after 50 or 60 pages of preliminary work, at once takes up the subject of tools for metal cutting, and gives details of standard English machine tools of all kinds. Among the principal machines illustrated are milling, planing, shaping and slotting machines, screw-cutting, surface, face and wheel lathes, head stocks, milling machines and radial drills. No small amount of attention is given to tools for cutting iron, the methods of holding them, influence of feed upon the pressure necessary with a given feed, and other matters bearing upon the power required to do a certain amount of work. Tables are given showing the pressure on the tool-point with a certain depth of cut, speed of revolution and feed. These tables cover cast and wrought iron and steel. Of the value of these tables little can be said, as may be judged from a criticism which we publish elsewhere. There are also graphic illustrations covering the same ground. The author refers in a very happy way to some of the mathematical papers published in Holtzapfel's works, saying of them that they are singularly apt illustrations of the extremely vicious results occasionally met by mathematicians who interpret nature by algebraic formulas alone, without the aid of experiment. The author himself evidently believes that mathematical theory is the only possible way of ultimately describing fully developed scientific knowledge, but he also believes that it is worse than useless to dabble in mathematical theory before becoming thoroughly familiar with all the facts of the subjects obtainable by experiment and observation. Unfortunately, the experiments in this case are hardly satisfactory.

Scientific Proceedings of the Ohio Mechanics' Institute.

This is a monthly which, as its name indicates, is a report of the proceedings of the Ohio Mechanics' Institute. It is published by the Publication Committee, at Cincinnati, Ohio. It has an attractive table of contents and will be found valuable by a large circle. The publication is now in its second year. It is well edited and its condensations are very creditably made.

Coal in Texas.

In Southwestern Texas all fuel is scarce. Mesquite wood commands from \$3.50 to \$5.75 per cord, and 1 ton of good coal is estimated as equivalent in calorific power to from 1 1/2 to 2 cords of this wood. Such coal as has been heretofore used in the above-named section was brought from Indian Territory or from Gulf ports, having been carried to the latter by water. Lately the Rio Grande and Pecos Railway has been built, and on the coal lands along the line of the road belonging to the company several mines are now opened about 25 miles west of the city of Laredo. The coal mines in the Indian Territory are 625 miles distant from Laredo, the present terminus of the road, and the outlet for its coal supply. With the exception of an inferior lignite, no coal is known to exist in Texas nearer to these coal fields than 400 miles in a direct line, and this deposit (the Brazos coal field) is undeveloped. A large market is therefore open to the fuel obtained from the beds in the Rio Grande Valley. It is estimated that the present demand for coal at Laredo would be for supplying 1000 miles of railroad in Texas, 45,000 tons; for supplying Laredo, San Antonio and adjacent country, 12,000 tons, or a total of 60,000 tons per annum. In this estimate a probable demand from Mexico for railroad and metallurgical purposes, or a coal supply to the Gulf ports, which now obtain this fuel by vessel, have not been considered. The 60,000 tons are a safe basis for the present requirements of Southwestern Texas, but the rapid advance of the railroads and increase of manufacturing interests and of population, it is believed, will cause a largely augmented and constantly increasing demand.

The two drifts on the railroad company's land known as the Hunt Mines are run parallel into a hill; one is 365 feet, with a cross-cut 277 feet, and the other 542 feet in length. They can, as at present arranged, produce 130 tons per day, and this output can be doubled with a limited expenditure. The thickness of coal in the Hunt Mine is from 18 to 26 inches. Test pits and exposures indicate a persistence of the coal veins and the existence of others. Three workable veins of coal are believed to exist on the property, and a large working shaft is now being sunk with a view of cutting all of them. The two seams below the present workings show in the test pits 24 inches and 50 inches of coal respectively. The high price now paid for mining coal (\$2 per ton) is made necessary by local conditions, scarcity of skilled labor, &c. By increasing the output, the cost per ton for ventilation, handling, superintendence, &c., will be largely reduced, and by improved methods in mining from the present openings the coal should be delivered on cars at a cost not to exceed \$2 per ton. The coal sells at Laredo at retail at \$6 per ton, and as wood is sold in large quantities at \$3.50 per cord to railroads, it is not too high comparatively. Coal brought from Pennsylvania and the Western States sold January 1 at New Orleans at from \$4 to \$5.50 per ton for bituminous, and \$7.25 to \$8 for anthracite, so that at \$4.50 per ton, wholesale, coal at Laredo would be in great demand in a large area.

The coal shows a marked absence of sulphur, and burns freely. For the present,

Mexico offers a market for from 15,000 to 20,000 tons per annum, and as the railroads are extended this will be constantly augmented, so that the demand would seem to be greater than the estimate above given. At present the Rio Grande and Pecos Railway is constructed from Laredo to the Santa Tomas mines, and has over 29 miles of track laid with heavy iron rails on good sawed sills; the bridges are excellent and the road well made. There are good water service and excellent terminal facilities, and substantial turn-table, houses, &c., are now in course of construction. The Santa Tomas Mine is not on the Rio Grande and Pecos Railway Co.'s land, but is leased by the company. This opening is a drift some 800 feet in length on a 30-inch vein of superior canal coal. Mining here now costs \$1.50 per ton, but it is expected to materially reduce this price. The Rio Grande and Pecos Railway is projected along the valley of the Rio Grande from its mouth to the confluence of the Pecos River, thence up the valley of the Pecos. It is proposed to complete at once the division of 120 miles from Laredo to Eagle Pass, so as to have outlets for the coal found along the line of the railroad.

Manufacture of Leather Belting.

The particulars necessary to a full understanding of the manufacture of leather belting are given in an interesting pamphlet issued by the Page Belting Co., of Concord, N. H. The heavy green hides purchased exclusively for belting are stored in large piles in an apartment allotted to that use—some packed in salt, while others, which have been through the salting operation, await, in a cured condition, their turn to enter upon the first process of the manufacture. A careful sorting of the hides is made, and any which may not be suitable for the purpose are thrown out. This storage apartment opens directly into the "beam house," as it is called, where the hides are prepared for the tan liquors. The hides having been soaked in vats, the flesh left on them by the butcher is removed, and they are put into vats filled with a weak solution of lime. From these weak lime the hides are advanced at regular intervals into increasingly stronger limes, being turned by reel out from one vat into the next, the hides being attached to one another and forming a sort of belt. When they have passed through the entire row of lime vats, they are taken from the last and strongest and thrown over beams, and the hair is removed. After being "unhaired" they are again carefully sorted, in order that any green hides supposed to be fit, but which the process proves to be unfit, for belting, may here be rejected, and so only belting hides pass into the tanning liquors. After this, various millings and soakings take place for the purpose of preparing the hides for the removal of the lime, which is finally effected by machinery.

The hides are then carried to the tanning department. Somewhat independent of this department, and in other rooms, the bark is steeped or leached, the liquors being prepared for use and stored in large reservoirs, where they are cooled and mixed to any required strength. Each stage of the process requires a different degree of strength. From the tanks before mentioned the liquors flow into the head vats of each section, the vats being so arranged as to permit the liquors to flow slowly down the sections to the foot-pits, where the green hides are placed on coming from the "beam house." At regular intervals the hides are advanced or carried along the section until they finally pass through and leave the "head" vat. Consequently these eight vats in each section are filled with leather in as many different conditions in the process of tanning, and also with liquor of as many different degrees of strength. From the "foot" vat the liquor, from which all its tanning properties have been extracted, passes to a large underground tank, where by machinery it is pumped off for another use. The partially tanned hides now, in another form, go into various liquors where a similar uniform and systematic course is pursued. The advance which has been made in the methods employed in this industry is strikingly illustrated by the modern bark mill. Among its advantages are the uniform quality of the ground bark and the speed with which the work is done. No further handling of the bark takes place, as it is conveyed by machinery to the points where it is used. In the general process of currying the first stage is that of scouring, which consists in treating the leather by a powerful machine until the grain is soft and smooth, and bodies that would be injurious to the finished leather are removed. After the leather has been stuffed or greased it is put into the dry-rooms specially fitted for the purpose. At the proper time it is "set" by the scouring machine, after which the drying process is completed, and the leather is packed in large piles to secure a certain desirable condition. When this condition has been obtained the leather is stretched. By the stretching machine the moistened leather is subjected to a uniform and powerful strain. When the proper strain has been secured, and the leather fastened so that it will not give back, that which appears to be the top of the machine is removed to a dry-room, and another set of clamps placed on the machine for like filling. So the process is rapidly repeated until a large number of these clamps or stretchers are stored in suitable dry-rooms, where they remain until the leather is perfectly dry. Then, when taken from the clamps, it completely retains its stretched condition. The last process before entering what is known as the "belt shop" is the finishing or polishing of the surface.

Of the actual work of making the belt, which is performed in the "belt shop" proper, there are several stages. On coming into the room the leather is straightened on one side and then stripped very rapidly through a gauge into various widths as wanted. After this process the strips are carefully examined, and the various widths are packed by themselves and stored until required for the next process, when they are taken to the fitting-tables and properly divided to various rolls, so that uniform thickness in each roll shall be secured. The waste is then cut off, and the strips so prepared

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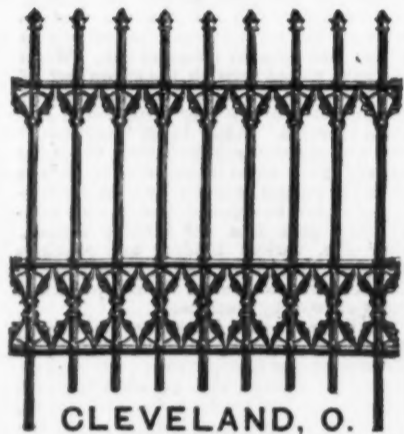
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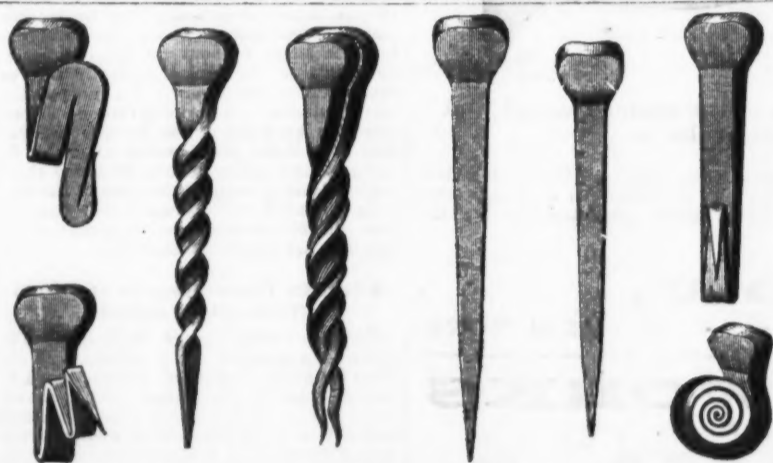
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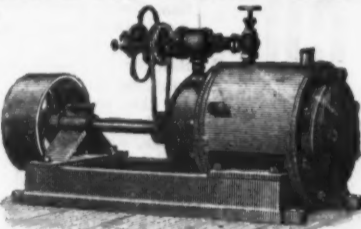
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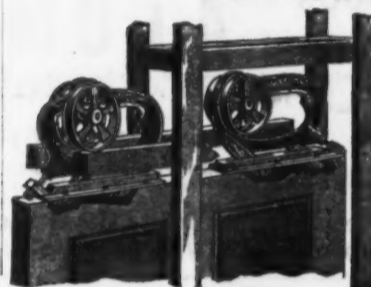
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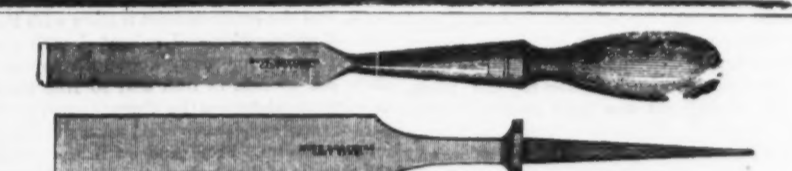
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are transferred to the scarfing machine. The strip is held by a friction clamp roll. The part to be scarfing down to form the splice is placed over a knife, and with the right hand a roller is dropped down upon the leather. The treadle is then depressed, applying the power communicated by the belt at the left of the machine, and a perfect scarfing is instantly effected. The whole operation is the work of a few seconds. These strips, with splices all prepared, are now ready for joining together in the continuous belt. A cement especially prepared for the purpose is applied to the connecting parts, and the lap is then placed in the press, where it is subjected to a heavy pressure, remaining in this position until the cement is "set." After the pressing the belt is measured into coils of the required length, about 300 feet being the usual standard. Copper rivets are put into the laps at the riveting tables, and at the burring tables burrs are fastened to the rivets on the opposite side of the belt. This is the usual manner of fastening the laps. In some cases, however, belts are made to order, where, instead of riveting, the laps are sewed either with lacing or waxed thread. The final operation is the winding and finishing of the coil, the machine for which purpose stands at the extreme left of the belt room. The same motion that winds the belt into a solid roll draws it through an attachment of knives and finishers, which trim the edges true and give them a hard, smooth and handsome finish.

The celebrated Chinese Encyclopedia, which was purchased by the trustees of the British Museum some months ago for £1500, has been safely lodged in that institution. It forms the most important acquisition to the great national library which has been made for some time past. The work is remarkable as having nothing parallel to it extant in the literature of other countries. It is comprised in 5020 volumes, and consists of a vast *thesaurus*, into which is digested the entire mass of Chinese literature extant at the date of its publication, classified under appropriate headings, and accompanied with illustrative drawings, plans and maps. It includes the treatises ranging from 1150 B. C. to about the year 1700 of our era, and it professes to represent every branch of Chinese literature, with the single exception of works of fiction. It was compiled in the early part of the eighteenth century by an imperial commission under the orders of the great Emperor Kang Hi So, well known to us from the accounts of the Jesuit missionaries, whom he favored and assisted, and who were his instructors in European art and learning. This Emperor was himself a great writer, and he was struck, in the course of his literary investigations, by the alterations and corruptions which are gradually being introduced into the texts of standard works. He therefore conceived the idea of reprinting from the most authentic editions the whole body of Chinese literature then in existence. A commission of high officials was appointed to select and classify the texts, and its labors extended over 40 years, terminating in the publication of the work in 1726. For the purpose of printing it a complete font of copper type was cast, under the direction of the Jesuits, who probably superintended the printing. Only 100 copies were printed, a number which has been much reduced since the time of the issue by various casualties. The whole impression was distributed as presents among the princes of the imperial family and the great State officials. The type used in the production of the work is said to have been melted down shortly afterward and converted into money to meet the exigencies of the Government during a financial crisis, and in this way the means of producing a second edition was destroyed. The copies which still exist are in the hands of the families of the original recipients, from one of whom the copy just happily brought to London has been purchased. So completely private is the ownership of copies of this Encyclopedia in China, that no copy is known to be accessible for reference to the general body of students of that country.

The Great Chinese Encyclopedia.

The Industries of Middlesborough.
Mr. Robert P. Porter, from whose letters to the New York Tribune, we have quoted before, writing from Middlesborough, says: After all, Middlesborough is but a new town—a new town for England. Though it has 60,000 inhabitants, it has not a directory. The whole history of the district is recent, and there has really been so much modest silence about it that a stranger may be excused for singing its praises. In my last letter I gave a view of Middlesborough from the summit of a blast furnace. The town seems to be literally surrounded with mountains of slag, and only about 45,000,000 tons of iron ore raised so far. What will it be when the 5,000,000,000 tons yet remaining are raised and smelted by the aid of the 10,000,000,000 tons of coal in the adjacent great northern coal field? To-day, says one writer, describing Middlesborough, the whole place seems surrounded by the refuse of smelted ironstone. And he is right—immensely long embankments of it, ravines and gorges formed of it, such as you may see in a country of tall hills; acres of land over which the sea or river recently washed, now reclaimed, cultivated, built on; here a vast area of buildings erected by the new Northeastern Steel Works Co.; there the Britannia Rolling Mills, barely visible in the thunder-storm of smoke—flashed up now and again with the darting of furnace fires—that rolls from their numberless chimneys; in another place more dense smoke, fringed with volumes of white steam, with red flames restlessly playing among the piebald folds, and everywhere slag—slag as high as it can be piled; slag defining the river's windings; slag like huge lumps of brown rock, with locomotives rushing along its leveled tops; slag in steep cliffs, covered with great red palpitating patches of it fresh from the furnaces, and just now tipped over by the engines and bogies, which all day long, and all night, too, are rattling and screeching to and fro in discharge of

this duty. And away in the hazy distance one can see the outline of the Cleveland Hills, the iron acclivities from whose side Middlesborough and its wonderful industries have sprung. I have been over the Cambria, the Edgar Thomson and the great Chicago Bessemer steel mills, but the works at Middlesborough even exceed them. I borrow the following description of a scene at Bolckow's works; it is the most graphic I ever read:

"My memory recalls an entrance guarded by a policeman of a severer aspect than any that I can remember encountering in a London constable; a vast surface of railway metals, over which one must jump with the agility of a fawn to escape the numerous locomotives which rush to and fro in shoals; an immense interior, full of huge roaring flames of sun-bright brilliancy—of fires rushing from the converters under the furious tempests of wind driven into them by mighty engines, scattering immense showers of sparks, licking the iron heights of the building with their serpentine tongues; sometimes of a deep scarlet hue, sometimes of a beautiful dazzling green, sometimes so white, blinding and ardent that in the enormous gushes of effulgence the numerous electric sparks which illuminate the building faint and glimmer like mere glow-worms; a floor covered with railways, along which little locomotives—mere toy engines in size—go pushing or dragging wagons, or bogies, or trucks, or whatever their name may be, full of molten, palpitating metal, or gigantic lumps of red-hot steel; on high, great bell-shaped retorts swinging slowly, and, as they swing, spilling torrents of white-hot slag amid volumes of smoke and steam and avalanches of sparks; and ever and anon stooping their brows, as it might appear, in their stately, solemn vibration, to expose their interior of fluid steel, the terrific light of which is so blinding that the pained eye droops before the volcanic fires as it would before the noontide sun."

Swearing by Telephone.

Speaking of the transmission of profane language through a telephone, the *Electrical Review* reports a circuit judge in Ohio to have recently decided that it could not be tolerated, that it constituted a violation of contract with the company furnishing the instrument and also constituted a sufficient cause for its removal. This decision, continues our contemporary, will be read with surprise and bring consternation from one end of the land to the other. The rule of the telephone companies prohibiting swearing has, up to the present time, been looked upon as only a refinement of sarcasm, as an indirect moral lesson, or, at the very worst, as but a fulcrum upon which, when hard pressed, they could place a lever of sufficient power to lift up the law against an objectionable patron. It is the part of the moralist to metaphorically seek the highest hill, clap his wings, blow his horn, and call all hands to rejoice with him over this decision. Unfortunately, however, heterodoxy cannot be corrected by trepanning, nor profanity abolished by statute. We regret this sincerely, but, as practical men, are compelled to look things square in the face; to see them as they are—not as we would like them to be.

We have in our mind's eye an ideal world—a Utopia in which there is no wrangling, no brawling, no evil speaking, lying and slandering; where men approach the telephone with subdued voices, and, when interrupted in the middle of a message by a minion of the central office, politely ask his pardon and patiently await his pleasure. But there would seem to be a something in the use of the telephone which is an incitive to wrath—a something that tries men's souls. Those who have been in the habit of using this instrument have doubtless been surprised at the frequency with which unparliamentary language, not to use a harsher term, passes to and fro along the wires. Men who, in private life, are accustomed to select their adjectives with a scrupulous nicety, are audibly pictured by the telephone as engaged in heated controversies with the central office, made up in great measure of language not to be found in any current religious works.

"When a gentleman is disposed to swear, it is not for any standard-bearer to curtail his oaths," says Cloten in "Cymbeline." The learned Ohio judge, is, however, inclined to the contrary opinion. He says: "The telephone reaches into many family circles; and it must be remembered that it is possible, from the peculiar arrangement of the instrument, that a communication intended for one individual will reach many others." Doubtless many judicious persons would suggest that, as impurities in a stream may be rectified at its source, swearing along the line of the telephone might be curtailed by disciplining the central-office clerks who incite it. This is, however, a mistake. So many persons are so inconsiderate as to take up more time in sending a message than is absolutely required; others are inattentive, and the operators must use diligence and hasten them.

Mr. Herbert, Third Secretary in the Russian Embassy, sends home from St. Petersburg a very interesting report on the progress of Russian mechanical industries. Among other things, he points out that while mowing and reaping machines are for the most part made at Warsaw, steam engines are largely imported, notwithstanding the heavy duty of 85 copecks (old) per pool imposed in 1881. Thrashers and all the more complicated sorts of machinery are also largely received from abroad. Traction engines form a large part of the imports, the duty of 30 copecks per pool preventing neither the large proprietors nor the peasants from buying them.

According to Austrian advices, the Government has proposed to establish a training school for those having charge of boilers, and it is thought that the information gained by firemen in this way will be of considerable value in reducing the large number of boiler explosions annually recorded. The instruction to be given will not be theoretical only, but the attendants of the school will have every opportunity to test their abilities in a practical manner, and instruction will be given by men who have had a long practical experience in connection with boiler management.

The Iron Age

AND

Metallurgical Review.

New York, Thursday, April 26, 1883.

DAVID WILLIAMS, Publisher and Proprietor.
JAMES C. BAYLES, Editor.
JOHN S. KING, Business Manager.

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Complete Iron and Steel Statistics for 1882.

The Secretary of the American Iron and Steel Association, Mr. James M. Swank, has completed the collection of iron and steel statistics for the United States in 1882. We take from advance sheets of his forthcoming annual report the following summary of the production of 1882, compared with that of 1881:

Products.	1881. Net tons.	1882. Net tons.	Per cent. Inc. or Dec.
Pig iron.....	4,641,564	5,178,722	Inc. 11
Spiegeleisen, included above.....	31,086	31,065	Inc. 4
Bessemer steel rails.....	1,330,300	1,138,135	Inc. 8
Open-hearth steel rails.....	25,217	32,763	Dec. 10
Iron rails.....	484,581	227,874	Dec. 53
Total rails.....	1,840,100	1,688,794	Dec. 8
Steel rails, included above.....	21,354	32,286	Inc. 3
Nails and spikes.....	289,709	307,355	Inc. 6
Bar, rod, skelp, hoop, and shaped iron.....	1,491,555	1,545,788	Inc. 4
Iron plates and sheets except nail plate.....	373,082	412,814	Inc. 11
Total rolled iron, except rails.....	2,155,346	2,365,957	Inc. 5
Total rolled iron, including rails.....	2,443,927	2,493,831	Dec. 6
Crucible steel ingots.....	89,762	85,069	Dec. 5
Open-hearth steel ingots.....	146,646	160,542	Inc. 9
Bessemer steel ingots.....	1,539,157	1,606,450	Inc. 10
All other steel.....	3,047	3,714	Dec. 3
Total steel.....	1,778,973	1,945,995	Inc. 9
Blooms from iron.....	45,359	48,354	Inc. 7
Blooms from pig and scrap.....	39,237	49,930	Inc. 0

The quantity of nails and spikes above given is equivalent to 5,794,206 kegs of 100 pounds in 1881, against 6,147,097 kegs in 1882.

The most notable fact about the above table is that for the first time for several years the production of some articles shows a decrease. We are accustomed to an increased production of all kinds of iron and steel, and this is a new experience, showing that we have for the present reached the climax of production, and a reaction has set in. Prominent among the articles showing a decrease are iron rails, which fell off 53 per cent. in 1882, as compared with 1881; then come open-hearth steel rails, followed by crucible steel ingots. The falling off in iron and open-hearth steel rails was only to be expected with the increased supply and more reasonable prices of Bessemer steel rails, but the decreased production of crucible steel was hardly looked for. It shows, however, that the competition of the cheaper steels is making itself felt, and we will now doubtless see from year to year a diminishing field in the occupation of the crucible steel manufacturers. Of the articles in the above table which increased their production in 1882 over 1881, the percentage of increase ranges from 3 to 11. Pig iron and plate and sheet iron show the greatest increase. Bessemer steel ingots come next, open-hearth steel ingots and pig and scrap blooms follow, and then come Bessemer steel rails, or blooms, nails and spikes, &c. The increase in the production of plate and sheet iron is noticeable. In 1873 plate and sheet iron comprised only 10 per cent. of the production of rolled iron, but in 1882 it comprised 17 per cent., advancing in the time mentioned from 169,169 tons to 412,814 tons.

It is remarkable that the strike in the Western mills, which closed up so many works for four months last year, did not cause a decrease in the year's production of merchant iron. The actual increase in rolled iron, excluding iron rails, was 5 per cent., or from 2,155,346 tons to 2,365,957 tons. We all know, however, that the Eastern mills ran to their utmost capacity during the Western strike, to supply the demand for iron, and after the Western mills got started they ran to such purpose for the remainder of the year that they not only turned out all the iron which they were capable of making, but they fully supplied the demand, glutted the market and have for months past been suffering the consequences. Taking the production of the two years in the aggregate, there was not much difference between them; the decrease in some branches being counterbalanced by the increase in others. We fear that the outlook for the present year is not favorable to a repetition of this experience, but that the statistics for 1883 will show reductions, perhaps heavy reductions, in every line.

The Metal Exchange Reorganization.

During the past week good progress has been made toward arranging the details of consolidation by the committees of the two Metal Exchanges. The constitution and by-laws of the new exchange have been agreed upon, and it is believed they will be adopted by the members without dissent. The feeling among the gentlemen more directly interested in promoting the scheme of reorganization seems to be one of great confidence in the future of the movement. We understand that between 50 and 60 per cent. of the members of the existing exchanges have signified their intention of joining the new one, and that subscriptions will be received as soon as the committee of twenty announce that their work is finished. Notwithstanding the effort which has been made by parties in interest to misrepresent our plain presentation of the facts in a recent issue, we can say with entire truth that we hope the best results sought by reorganization will be attained. So far as we can learn—and none have better opportunities for learning—the number, even of those intending to become members, who have confidence in the ability of an Iron and Metal Exchange to develop a large and permanent usefulness is not great. There

seems to be a very general disposition among members of the trades interested to aid the experiment to the extent of forming the organization, but two out of three are frank enough to say that they doubt the benefits of an attempt to organize trades combining elements so naturally antagonistic. We can see many and great advantages from harmonious co-operation in all matters affecting the rules and usages of the trades represented, in the settlement of differences between members, and in encouraging a more intimate and friendly personal intercourse. If those who join the exchange can be induced to visit it daily, to take an active part in its management, to transact as large a part of their business as possible on its floor, and to aid in making it a success, it will succeed, and the metal trades will be in a great degree controlled by its action. Whether they will do this remains to be seen. In the case of neither of the two original exchanges was it found possible to maintain an active interest after the novelty wore off. It may be, however, that the new exchange will fare better in this respect than its predecessors. Its success will not be promoted, however, by any amount of gong-beating and bluster on the part of Mr. Edward J. Shriver, nor by letters from him misquoting *The Iron Age* and attributing to mercenary motives statements which we have not made. There was too much of calling names and making faces when the rival exchanges were organized, and nothing will be gained by reviving this objectionable practice. We wish the new exchange success in proportion to the utility it develops, but we do not think its utility will be promoted, or the respect and confidence of the trade secured, by encouraging Mr. Shriver to vindicate the justice of Mr. Brinsmade's allusion to "the windmill on Pearl street," or the propriety of the proof-reader's error, due to blind chirography, which made it read "mud mill" in print.

The Drop in Iron.

Within the past few years the iron market has been subject to controlling influences which, though fatal to purely speculative combinations and destructive of weak interests, have, in the main, tended to produce and maintain a healthy basis of values. In this respect we do not know but that the iron trade is peculiarly fortunate. A weak and drooping market, with actual transactions not only below nominal quotations, but with offerings at constantly increasing concessions, is vastly more satisfactory to producers and consumers than prices cut down to the actual basis of a value representing the existing relation of supply to demand. For some time past the iron market has been weak and unsettled. No one has felt any confidence, nor known what to expect. Consumers have been induced to look for still lower prices, and certain brands have been pressed on buyers by a standing offer to sell at two dollars a ton under the market, whatever the price. Such a condition was fatal to every interest involved. Meanwhile, there has been a steady accumulation of iron in first hands, and very little disposition has been manifested on the part of makers to reduce production to a point at which it would leave a full supply without surplus. It has seemed wise to the representative of one of the leading Lehigh companies to put prices at once to a figure which will more nearly represent actual selling prices than the nominal asking prices of last week, and the announced reduction of two dollars per ton for Thomas iron has simply effected at once a result which must inevitably have been reached by more painful and disastrous, if slower, methods.

Under such circumstances as those which exist at the moment in the iron market, it is the worst kind of folly to shut one's eyes to the facts of the case. No one is deceived by a false showing of firmness when prices are hopelessly weak and tending downward, and the producer who holds on, hoping against hope, and refusing to blow out his furnace when he cannot meet the market without loss, and when nothing but a curtailment of production will restore the market to a healthy tone, has no reason to complain if helped to a decision he is so reluctant to make for himself. All connected with the iron trades will have reason to be glad when bed-rock is reached and prices cannot decline further. It is possible, but not probable, that this has been secured by a cut of two dollars a ton on pig iron, and if another reduction of two dollars is necessary, the best interests of the trade demand that it be made. We are sorry that the necessity exists, but since it does exist we are glad to see the market prices put down to the figures at which iron is selling. Our representatives in Congress might just as well see what the force of tariff revision has done for the country. Cold stacks and idle mills will more strongly emphasize the folly of the last Congress than even a weak market with an oversupply of iron. Let us see just how badly we are hurt. There must be bottom somewhere, and if it is not reached until we touch a figure at which few furnaces can run, and none make a profit, the sooner we get down to that figure the sooner will confidence be restored and consumption begin to show a healthy increase. Meanwhile we shall witness a decline in the cost of production, and the furnace interest will be in good shape to take advantage of an improved market as soon as improvement shall come.

The Development of New Iron Districts.

Within a comparatively few years much has been done toward the development of iron districts in the United States, which had previously not been known as such or else had been very imperfectly examined. The Hocking Valley of Ohio, the Birmingham district of Alabama, Southeastern Tennessee, and the Shenandoah Valley of Virginia, will all occur to the minds of those who keep pace with the industrial development of the country. In the number of new blast furnaces and of iron enterprises under way, these are the principal new districts. Less prominent, but none the less worthy of mention, are the new iron works in the Sierra Nevada Mountains of California, and on the shore of Puget Sound in Washington Territory, while in the fastnesses of the Rocky Mountains in Colorado a most ambitious new enterprise is in successful operation, over 1000 miles from any rival, and another is contemplated. Even Utah is struggling to join the ranks of those who value their nature and compel the crude ore to yield its wealth of useful metal. The mountains of Western North Carolina, too, will ere long witness the beginning of an iron industry of no mean pretensions.

Among these several iron districts there is none whose late development causes more wonder than that of the Shenandoah Valley and the western region of the Old Dominion. Years and years ago this part of Virginia was known to be very rich in iron ore, and there were quite a number of little charcoal furnaces scattered through the district, each making a few tons a week of cold-blast iron. But the most of them were abandoned when the furnaces further north got to making cheaper iron with anthracite coal or coke, and that iron was rolled into merchant iron by modern rolling mills instead of being hammered in antiquated forges. Various causes prevented the old owners of the rich Virginia ore beds from following up the various improvements in Northern furnace construction, which sealed the doom of their works. A new generation had to come upon the scene, fresh impulses had to be brought to bear, and keener industrial sagacity had to make itself felt, before this region awakened to new life. The officers of the Shenandoah Valley and the Norfolk and Western railroads are the fairies whose wands have touched the sleeping giants of the Old Dominion and caused them to look about their possessions and discover their fair inheritance.

And now not only have charcoal furnaces been improved and enlarged, but new coke furnaces have been built and are being put in operation as rapidly as possible. Ore banks are being opened everywhere, abandoned workings examined in the light of modern geological and chemical knowledge, explorations for new ore fields made on almost every farm, and the entire district is alive with the keenest anticipation and animated with the highest hopes, for many developed deposits show ore so rich in iron and so free from deleterious substances that there is every prospect of rapid riches showering upon the fortunate possessors. Prof. Andrew S. McCreath, the chemist of the Geological Survey of Pennsylvania, says, in a recently-published report on the mineral wealth of Virginia, that, excluding manganiferous ores, the average of 34 samples of the brown hematite ores from the Shenandoah Valley shows the following:

Metallic iron.....	49.582
Phosphorus.....	1.322
Phosphorus in 100 parts iron.....	2.666
Omitting the phosphatic ores, the following will show the general average character:	
Metallic iron.....	48.646
Phosphorus.....	.859
Phosphorus in 100 parts iron.....	.537
Along Cripple Creek, in Southwest Virginia, there is a limestone iron ore of great purity, existing in great abundance, which analyzes as follows:	
Metallic iron.....	54.514
Phosphorus.....	.106
Phosphorus in 100 parts iron.....	.194
Nine samples of red hematite and magnetite ore found in the limestone formation gave the following result:	
Metallic iron.....	62.090
Phosphorus.....	.038
Phosphorus in 100 parts iron.....	.061

The brown hematite ores accompanying them are equally pure, as follows:

Metallic iron.....	54.518
Phosphorus.....	.031
Phosphorus in 100 parts iron.....	.056

An abundance of Bessemer ore is found, which analyze from 47.15 to 66.47 per cent. of metallic iron, and have from .032 to .142 per cent. of phosphorus in 100 parts of iron. Manganiferous ores suitable for the manufacture of spiegeleisen have also been found in workable quantities and in convenient localities. But in Southwest Virginia and in the southeastern part of West Virginia is found an immense area of most excellent coking coal, which is now about to be brought into the market, and will speedily be available in unlimited quantities for the manufacture of coke pig iron in this highly favored region. So closely does this coal field lie to the ore beds that the cost of making pig iron along the Shenandoah Valley Railroad is put at startlingly low figures by Professor McCreath, and he evidently "speaks by the card." At Milnes, Page County, the Gem Furnace is now making coke pig iron at an actual cost of \$12.55 per ton. Coke is

brought from Connellsville at present, as the new railroad under construction has not yet reached the Southwest Virginia coal mines and coke works, which are in what is called the Flat Top region, at the town of Pocahontas. The general manager of the furnace at Roanoke, which will soon be put in blast, estimates that coke pig iron will cost him but \$12.58 per ton. The following are the details of these two figures of cost:

	Gem.	Roanoke.
Ore.....	\$1.50	\$4.79
Coke.....	5.25	3.69
Limestone.....	.70	.75
Labor.....	1.50	2.10
Incidentals.....	1.00	1.25
Total.....	\$12.55	\$12.58

The estimated cost of making pig iron at Buchanan is put at \$12.94 per ton, at Central \$11.89 per ton, and at New River \$11.03 per ton. These places are all mentioned as affording good furnace sites. These figures are very favorable to Virginia iron-making, when compared with some evidently authentic figures which Professor McCreath gives for some Pennsylvania and New Jersey furnaces, the most significant of which, and at the same time the lowest, is the statement for Phillipsburg, N. J., for the year 1881. It is as follows:

Ore.....	\$9.46
Coal.....	5.64
Limestone.....	.42
Labor.....	1.59
Incidentals.....	.76
Total.....	\$17.87

The furnaces at Phillipsburg are known to be well located, to have good iron-ore mines of their own within convenient distance and to be exceptionally well managed. On the basis of these figures, therefore, the question may well be asked, Why should not Virginia, which is such a short distance from the great centers of iron consumption, speedily become a very great producer of pig iron for all purposes?

Spontaneous Combustion of Coal.

The numerous cases of spontaneous combustion which have been reported in connection with ships carrying coal lead some interest to remarks made some time since before one of the scientific societies of Great Britain. From a paper submitted on this subject, it appears that in the year 1874, among 31,116 shipments, amounting to upward of 13,000,000 tons of coal, there were 70 accidents, and of these shipments, 26,000, amounting to over 10,000,000 tons, were to European ports. Inquiry revealed the fact that by far the greater number of the casualties happened on board ships which were on long voyages, and it was also found that, so far as the above figures are concerned, 60 disasters were divided among only 4485 shipments, amounting to 2,855,831 tons of coal shipped from British ports to Asia, Africa and America. In view of the many disasters which occurred, a royal commission was appointed in Great Britain to make inquiry into the causes of these catastrophes, and to suggest remedies which it might be possible to adopt in order to prevent and guard against them. In the course of their investigations it was found that the proportion of casualties traceable to spontaneous combustion increased with the tonnage of the cargoes, this becoming still more apparent when the European trade was deducted. In the year 1874 there were 2109 shipments with cargoes under 500 tons, in which 5 disasters occurred, or under 1/4 per cent.; 1501 shipments with cargoes between 500 and 1000 tons, in which 17 disasters occurred, or over 1 per cent.; 490 shipments with cargoes between 1000 and 1500 tons, in which 17 casualties occurred, or 3 1/2 per cent.; 308 shipments with cargoes between 1500 and 2000 tons, in which 14 casualties occurred, or over 4 1/2 per cent., and 77 shipments with cargoes over 2000 tons, in which 7 casualties were recorded, or 9 per cent. The disasters in vessels bound to San Francisco were perhaps the most remarkable. Deducting vessels under 500 tons, in which no cases of spontaneous combustion were recorded, the available returns showed 9 casualties out of 54 shipments, and these increased in proportion to the tonnage of the cargoes. It was, in fact, found that out of five ships with cargoes of over 2000 tons sent to San Francisco in the year 1872, two met with disasters of the kind here considered. Careful thought might have predicted results of this kind from a consideration of the nature of the substance carried, method of transportation and the place to which it was going.

So long ago as 1852 Graham pointed out that the tendency of coals to spontaneous ignition is increased by a moderate heat, and gave examples. For instance, in one case coal had taken fire by being heaped for a long time against a heated wall the temperature of which could be easily borne by the hand. In another case the coals ignited spontaneously after remaining for a few days upon stone flags covering a flue the temperature of which never rose beyond 150° F. Experience seemed to show that the character of the coals had very little to do with their ignition in such instances, since, if they were exposed to the very moderate heat mentioned they were certain to ignite. Coal conveyed through the tropics is at all times in danger. When coal takes fire spontaneously it is invariably in the center of the heap of small coal at the foot of a hatchway, or in the middle of the cargo, in this respect resembling combustion of hay-stacks, oily waste, &c., and from this it may be inferred that the increments of heat which accumulate are very small, since they must be confined by im-

passable barriers of non-conducting material, or they would escape. Coal in small quantity and in a cool place never ignites spontaneously, but it does not, therefore, follow that all conditions leading to spontaneous combustion are absent, but only that one of them—and that an all important one, namely, the means of accumulating heat—is absent, since the barriers interposed to its escape are not sufficiently close-fitting. Large ships going to San Francisco must encounter elevated temperatures, and at the same time the coal is in great mass and the vessels are therefore more liable to accident than those carrying smaller quantities and for shorter distances.

It is known that while wood is living, moderate heat, so far from causing its destruction, promotes its growth. When the wood, however, has ceased to live, moderate heat dries up its juices, renders it brittle and ultimately causes its complete disintegration. Wooden beams resting against hot plates which never reach the boiling point of water are sometimes found to be charred, but oxygen being of necessity excluded by the position of the wood, combustion does not occur. At the ordinary temperature of the air, oxygen has so little action upon wood that it is practically indestructible. In coal, however, the wood has undergone changes which render it far more readily affected by the oxygen of the air than it was before, and it must be borne in mind that if once a combustion is sufficiently rapid to overcome the cooling effects of the currents of air, it will proceed with increased vigor, and the ignited coal will burn not only in the interior of the cargo or heap, but on its surface also. Knowing, then, that the coal, if kept in bulk at a temperature slightly raised above the common is sure to ignite, the question still remains, How does it attain the degree of heat at which active combustion can take place? Also, at what temperature do the combinations of the carbon and oxygen, and hydrocarbons and the oxygen, begin to take place? In other words, What is the temperature of the initial point of combustion, and how is it reached? Many explanations have been given in answer to these questions. The well-known fact that heaped-up iron pyrites in shale, when vetted, often cause the combustion of the pile has been used as an argument against the shipment of coal containing such pyrites. Admitting this to be true, and that pyrites were disseminated through a portion of the cargo in sufficient quantity to cause evolution of heat when vetted, this would account for but a small number of the cases of spontaneous combustion of coal, since by far the larger number happen with coal free from this impurity.

Condensation of oxygen by carbon is probably a far more likely mode of attaining the initial temperature. Carbon in a finely-divided state has the power of condensing oxygen, thus naturally producing heat. When charcoal condenses oxygen heat is liberated, and if the charcoal be freshly burned, the rapidity of the action will produce such an amount of heat as to cause the chemical combination of the oxygen and the carbon, when, of course, combustion takes place with evolution of light and heat. The initial temperature of the action is here due to the sudden squeezing together of the gaseous molecules, for if the air be admitted to the freshly-burned charcoal by slow degrees, no combustion would take place. The tendency to oxidation which carbon and carbon compounds existing in such a substance as charcoal possess is favored by the condensation of oxygen within its pores, whereby very intimate contact between the carbon and oxygen particles is promoted. It is to this circumstance that the development of heat and oxidation is due. The latter is accelerated as the heat accumulates, and chemical action is thus promoted, and may, in the course of time, proceed so energetically that carbon or hydrocarbon particles may be heated to the glowing point.

This explanation has a direct bearing upon the question of spontaneous ignition of coal. The more porous and readily oxidizable portions of coal, which are known to be more largely disseminated through seams in different localities, undergo oxidation and absorption of atmospheric oxygen, and the heat developed by this action will accumulate under favorable conditions to such extent as soon to hasten the elevation of temperature to a point when some of the finely divided and readily inflammable portions become ignited. Water does not enter in spontaneous combustion, except where pyrites are concerned. There seems to be considerable misunderstanding as to the part played by water in changes leading to spontaneous combustion. The water itself is decomposed. The heat evolved during the combination of hydrogen and oxygen from water must be supplied before they are again separated, so that, so far from being a producer of heat, it is more likely to be a consumer. Experiment, moreover, goes to show that coal requires no elevated temperature for its combustion, and the supposition of condensation by the coal, though it may take place, is unnecessary for its spontaneous combustion. Air blown into baryta water through a tube filled with coarsely powdered carbon furnishes a considerable amount of heat in a very short time, and the production of carbonic acid, the abundant proof that heat is produced, if the escape of this heat is prevented, immediately reaches a point at which combustion becomes visible, and in very many cases uncontrollable. It is thought that in

ventilating the cargoes of coal ships the principle of the Siemens regenerator is infringed upon to the great damage of the cargo. Air is forced through the coal, oxidation and heat follow throughout its course, the heat is absorbed by the coal, and the air, as it is continuously forced in, passes over surfaces which are becoming hotter and hotter. The air is consequently heated, and the work of combustion, once begun, goes on more and more rapidly. Altogether there is a pressing want for a thorough experimental investigation of the causes of spontaneous combustion. The reasons given may be correct, but thus far they are held up only by the feeblest experimental support.

The Marshall Failure.

The failure of James Marshall & Co., of Pittsburgh, referred to in our columns last week, as the facts in the case become known seems more and more remarkable, or perhaps it would be better to say that it is remarkable that such an enormous amount of liabilities could be piled up against one man without the alarm being taken long before. The facts seem to be that Mr. Marshall has been speculating in pig iron for some time. A number of months ago, in a lucky hit, he made quite an amount of money, and instead of being wise enough to let it alone, believed he could do the same thing over again. Iron was bought at what is now a very high price, and as it began to go lower, acting as most people do when buying on margins, he bought more and more in order to average the loss. When the crash came it was found that he was carrying in the neighborhood of 60,000 tons of iron, probably a larger amount of iron than was ever held by one man in the country at a time. The failure is for the nominal sum of somewhere in the neighborhood of \$2,000,000. Of course, a large amount of this is for pig iron that is on hand; in fact, which has been used as collateral to borrow the money with. The actual loss, however, promises to be from \$300,000 to \$500,000—how much is not positively known at the present time. Most of the banks holding his paper are secured by collateral. The loss will fall most heavily on his friends and some of the furnaces from whom the pig iron was bought.

The amount of the loss will largely depend upon the settlement of the question as to whether the property of the firm of James Marshall & Co. can be held for the debts. This firm was organized by the late James Marshall, Sr., and upon his death, some years since, the property was left to his four children. The estate has never been settled, and it will probably be a matter of litigation whether the estate can be held for the debts incurred by the present Mr. James Marshall, who owned only one-fourth interest in the estate. His failure was not wholly unexpected, and therefore did not have the depressing effect on the market that it would have had if it came without warning. No failures of any importance have yet followed it, and though the fear that the pig iron held as collateral might be forced upon the market, and break it, has had some little effect in depressing the prices of pig iron in Pittsburgh, still the effect has been by no means marked, and as the banks are amply secured at the price at which the iron was put up as collateral, there is no occasion for their forcing sales, and the iron will be gradually taken up in small lots, so as not to injuriously affect the market.

Great crashes are very apt to evoke echoes, but very rarely are heard such strange rumblings as come to us from Pittsburgh just now in reference to the Cosgrave trial, an outgrowth of the Siemens-Anderson failure. Without entering into the merits of the case, it may be said that the proceedings, if correctly reported, are marked by an unconventional freedom and originality which it is refreshing to read of in these belated spring days. It seems that the judge before whom the first case of the Merchants' and Manufacturers' Bank against Mr. Cosgrave was tried privately visited the jury-room to give that peculiarly constituted jury the further instructions they desired—without notice to or presence of counsel—and when, half an hour later, this jury brought in a sealed verdict, one of the twelve good and true men, even brighter than the rest and certainly more obliging, informed a newspaper reporter of the nature of that verdict. The high esteem in which the presiding judge is held will probably absolve him from all suspicion of sinister motives, but considering the well-known tendency of bank directors to hold some particularly unfortunate debtor in order to vindicate or distract attention from their own loose business methods, it might reasonably be expected that in a case like this some attention would be paid to securing a jury of at least average intelligence.

A great deal of discussion is going on in reference to the injury that the electric light does the eye, and some capital is being made in regard to the danger that results from the arc light. Several gentlemen have had their eyes seriously injured by watching this light too closely. A vast amount of high science has been expended in trying to find out just what the cause is—whether it is an excess of ultra-violet rays or simply on account of the intensity of the light. The fact that, though the light be gas, kerosene, incandescent electric light or an electric arc, the human eye is injured by staring directly at the source, has been ignored. The more powerful the lamp the greater the danger,

and it is not necessary to suppose that there is any inherent danger in the light itself in order to account for the accidents that have happened from staring at one of these exceedingly brilliant arc lamps. If a man will take off the shade of his student lamp and stare at the brilliant flame he will find that it will produce blinding effects, but we shall not attempt to say that the injury is from the "ultra violet" or something else.

Mr. Richard Proctor makes a very curious suggestion in a recent number of his paper, to the effect that the spreading of so large a quantity of iron upon the surface of the earth as modern science is doing is likely, in the future, to exercise a very decided influence of its own upon electric currents and magnetic storms, and in this way to exercise a very material meteorological influence. The network of railways and the substitution of iron for wood all over the country is going on steadily and in a rapidly increasing ratio. Even the Western prairies are being netted in all directions by wire fences, and in calling attention to this fact Mr. Proctor thinks that here is a problem that science will be shortly called upon to solve. At any rate, there is food for thought in the suggestion.

A correspondent reminds us that we were in error in speaking of the Tillie Starbuck, lately launched from Mr. Roach's shipyard at Chester, as the first iron sailing vessel built in this country. The Tillie Starbuck may be the first American sailing vessel, iron built and iron rigged, but an iron vessel, the bark Iron Age, was launched in Philadelphia about eight years ago, and was the first American vessel of her class.

OBITUARY.

JAMES PARK, JR.

On Saturday morning, the 21st inst., Mr. James Park, Jr., the well-known steel manufacturer of Pittsburgh, Pa., died at his residence in Allegheny, after a short illness. Mr. Park had been in his usual health up to Wednesday. On the morning of that day he attended to some business at the County Commissioner's office, and went home in apparently good health. He was found in his library late in the afternoon in an unconscious state, from an apoplectic or paralytic attack, and remained unconscious until his death on Saturday morning.

Mr. Park was one of the best and most widely known of the steel manufacturers of this country. His long connection with that business, the extent of his works, the character of their product, his frequent trips to Europe in connection with his business, as well as the interest that he has taken in all matters of tariff legislation and construction, have caused his name to be widely known in all steel-making and steel-consuming centers. Mr. Park was born in Pittsburgh, January 11, 1820, and was consequently in his 64th year. His father was a native of Ireland, and, after having been in business for a short time in Baltimore, removed to Pittsburgh in 1812. Mr. James Park, Jr.'s first employment was in the warehouse of his father, in 1837, in the queensware department of the establishment, which included both the metal and the grocery business. He displayed such aptitude for trade that in 1840 he, with his older brother, was admitted into partnership, the former being given exclusive charge of the queensware department, though only 20 years old. In 1843 Mr. Park, Sr., died, and shortly after the present firm of Park, Brother & Co. was organized. The grocery and queensware portion of the business was dropped and that in metals continued. Mr. Park also took an early interest in the development of the Lake Superior copper region, and erected a copper rolling mill, which still stands in the same inclosure with the Black Diamond Steel Works, the copper business being carried on under the name of Park, Scott & Co.

In 1862 the Black Diamond Steel Works were organized, and, in the face of many discouragements, both financial and practical, they have been carried on from that time to this, until now they have the largest melting capacity of any merchant crucible steel works in the world. It is in connection with the manufacture of steel and copper that Mr. Park was the best known, though those industries by no means exhaust the list of manufactures in which he was engaged. In early life Mr. Park was interested in the manufacture of cotton goods in Allegheny, an enterprise in which he retained an active interest for many years. He was also at one time a partner in the extensive cast-iron pipe manufacturing works of William Smith & Sons. In the reorganization of the foundry firm of McIntosh, Hemphill & Co., Limited, Mr. Park took an interest, and became active in its management, being one of the directors. He was also one of the vice-presidents of the American Iron and Steel Association, and very active in its management.

Mr. Park has also for many years been extremely interested in all matters connected with tariff legislation and the constraining of the law after it was passed, and was a perfect mine of information as to tariff matters. The law at present in force, in its clauses relating to steel, was largely the work of Mr. Park, and the same can be said of the tariff law that will go into force on the 1st of July. Mr. Park also spent much time in Washington when tariff legislation was before Congress, and was ever ready with fact and argument to disprove the assertions so confidently made as to the effect of tariff legislation on prices. His long connection with the businesses that were affected by tariff legislation enabled him to speak with authority as to the effect of such legislation in reducing prices. His manner of stating these facts and his sincerity always carried a conviction of his perfect honesty in the statement made, and though free traders did not, of course, accept his views, they always believed that he was honest in holding them.

Mr. Park was deeply interested in matters pertaining to education, benevolence and reform. He was a director or trustee in a number of benevolent and educational institutions, and was a liberal contributor to others and to benevolent and reformatory associations. He was always solicitous regarding the welfare of his men, and aided liberally any movement looking to the bettering of their condition. Mr. Park was in many respects a remarkable man, with strong convictions and great tenacity of purpose, but generous and kindly. To resolve with him was to leave no means untried that were honorable to gain his end. No combination of discouraging circumstances could induce him to change his purpose. He never stopped short of success until he was thoroughly convinced that what he desired was impossible of accomplishment. Another characteristic was the rigid manner in which he enforced certain rules laid down for the conduct of his business. One of these was that no man or body of men who quit work suddenly, or, in other words, went on a strike, should be again taken into the employ of the firm. This rule was strictly enforced, and called forth adverse criticism in quarters where it was not known that while Mr. Park would not the second time employ a man who went on a strike, he never allowed any of these men or their families to suffer. It is stated that on numerous occasions he would one minute sternly refuse to take back a man who had struck, and the next put his hand in his pocket and give the party money to supply the wants of himself and his family. Another characteristic of Mr. Park was the exactness with which he fulfilled all promises, even in circumstances where the promise might be regarded as a conditional one. In pursuance of this policy his works have often been kept running in times of dull trade, and product to the value of hundreds of thousands of dollars piled in his warehouses in order that he should carry out his promise to give the men work for a certain time. Mr. Park's business will probably be continued without interruption, as his sons have for some time had charge of the different departments.

WASHINGTON LETTER.

(From Our Own Correspondent.)

WASHINGTON, D. C., April 25, 1883.

The Iroquois banquet at Chicago, and the strong feeling put out there in the direction of Mr. Tilden, of New York, as the standard bearer of the Democracy, with Hendricks or McDonald, of Indiana, as the constitutional residuary legate of the honors and emoluments of the office in the event of a demise of the party of the first part, has started quite a breeze here. It is a significant fact that whenever the name of an available person for Presidential nomination, be he Republican or Democrat, is suggested, the discussion of his merits hinges solely on the tariff and his relation to the two ruling doctrines of a tariff for protection or for revenue only. The selection of a Speaker for the Forty-eighth Congress will give a glimpse of the probable drift of things.

MR. RANDALL'S POSITION.

Ex-Speaker Randall believes in protection to the extent of a maximum rate to that end. In conversation with his friends he takes sides against tariff for revenue only, but does believe in tariff for revenue adjusted to the interests of protection so far as necessary to maintain the *status quo* of American labor and capital. This policy is likely to succeed, so far as the Speakership is concerned.

WHAT MR. SPRINGER THINKS.

Mr. Springer, who is the foremost agitator of the Carlisle theory of free trade, believes in abolishing all duties except so far as necessary to the revenues of the Government to enable it to meet its financial obligations, and believes in such an equalization of rates as will have no relation to the fostering of new and maintaining of old industries. Mr. Springer says that he is willing to take the chances before the people. He is very confident that what might be lost in one direction, politically speaking, would be more than made up in others. There is not much ground for encouragement for such views in Pennsylvania, even among the most ultra men on other questions, but Representatives, as they drop in here from other sections, gather up such data as they can get together, with the intention of giving the subject a preliminary touch in the campaigns of the present year.

FREE TRADE LEAGUE VS. PROTECTION.

The Free Trade League seems to be actively extending its organization, and expects by the time Congress convenes to present a compact front. Frank Hard, who is one of the most active spirits, writes to a friend that everything is going along satisfactorily. It might be well for the friends of protection to strengthen their organization for defensive purposes and to furnish timely information and support to its friends. The free traders concede that they may lose Georgia, Alabama and Louisiana in the South. This being the fact, it is hard to say what they will gain in the North on this issue to supply that loss. From a party standpoint, it is admitted that the Republicans can lose New York, New Jersey, Indiana, California and Oregon, and then win by carrying Virginia and North Carolina. To add the three Southern States above named to this list would only make Democratic defeat the more emphatic. But it is doubtful whether even any of the Northern States named could be carried on a distinctively free-trade platform. While the views and interests of rival politicians are absorbing public attention, it is more than likely the business interests of the country will step in and have something to say. The accumulated wealth of the people is a conservative factor which will have some influence when the time comes.

HERE MOST'S VISIT TO THE CAPITAL.

The visit of Herr Most, the German agitator, to the seat of government of Republican America, has not been a success. With the exception of a handful of idle adventurers who listened to his harangue in Chicago, his visit, as a whole, has not been a success. He will doubtless return to his communistic companions in the Old World a decidedly

wiser and disappointed man. Most, in common with his revolutionary theorists at home, seems to have grown into the belief that a government of the people is at best a crude sort of a thing, and subject to all the passions and excesses of human nature. He has found that the laboring man has as much in common with the stability of the Government and the enforcement of the laws as the capitalist, and appreciates the other important fact that his own comfort and employment is in building up, not in tearing down.

ADVISED TO HIRE A HALL.

The Federation of Labor in this city refused to listen to him as an organization, and, in fact, excluded him from their meetings. Then a resolution was presented inviting Most to address the meeting; it was met with decided opposition. A representative of the Bookbinders' Association offered a substitute observing that the American people are not ready to endorse his views as they understand them, and absolutely opposed giving him the privilege to speak. The vote against listening to him was large and emphatic. His friends claimed that he had been misquoted, great injury had been done him and his cause, and he should be permitted to set himself right. To this he received the reply, if that were the case his friends might hire a hall for him and give him a chance, but, as organized workmen, they did not wish to be committed to his doctrines, although they might have some merit in them.

BALLOTS AND NOT DYNAMITE.

He also had a few apologists who were willing to give him a fair opportunity to explain himself. A contractor and member of the federation, speaking of Herr Most's position on the labor question, said that he was a type of a large class of persons connected with labor unions in Europe. His ideas about extreme measures proper to be resorted to as a last resort would not suit here. The man has been reared in a different country from ours. His extreme methods are not so extreme where he would apply them; they certainly would not suit for us, and the trades unions do not entertain them. Our method is the ballot for redress, and we intend to accomplish all we need. The Senate, he added, failed to consider the eight-hour law last session. This will have to be settled next term, otherwise some Senators will find themselves settled; so will every other public man. "I do not refer to gunpowder or dynamite by this, but to the ballot," he explained.

THE LATE JAMES PARK, JR.

The death of James Park, Jr., of Pittsburgh, has caused universal expressions of regret in a large circle of friends and acquaintances here. Mr. Park remained at the Capitol during almost the entire time of the late session of Congress, watching with the utmost vigilance the progress of the committee deliberations and Congressional debates upon the tariff bill. He was one of the most influential of those interested in behalf of protection, and his experience in matters affecting the great industries of iron and steel gave his opinions great weight. If his views had been more closely followed it would have been better for all concerned.

ARRANGING FOR THE NEW TARIFF.

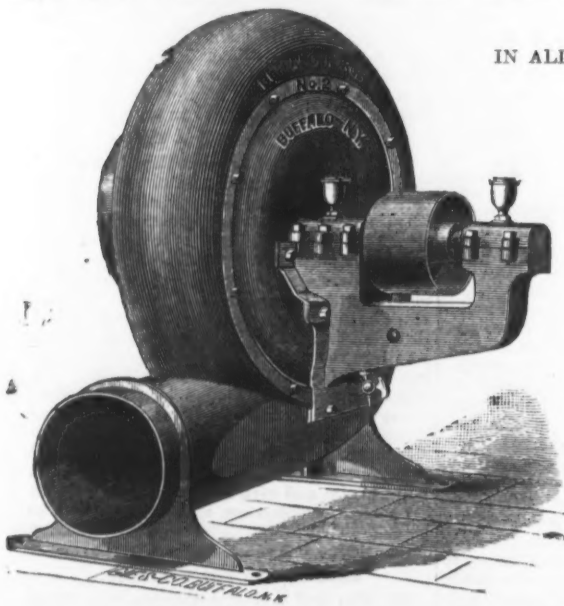
Assistant Secretary of the Treasury French has left for New York, to be absent about 10 days. The object of his visit is to prepare for the carrying out of the provisions of the new tariff.

Railway Extension in India.—Some interesting statistics relating to recent railway extensions in India have been published. From these it appears that at the end of the year 1882 to 1883 there were open for traffic 10,250 miles of railway, 2332 miles being in course of construction. During the year an addition of 290 miles of completed line was made and an increase of 1030 miles sanctioned. In the year 1860 the Indian railways carried somewhat less than 4,000,000 passengers, while in 1881 they carried over 52,000,000. In the former year the merchandise carried amounted to 632,613 tons, while in the latter it was represented by 11,637,000 tons. The traffic receipts were \$2,930,000 and \$68,630,000 respectively for the two years. The full significance of these figures will be readily understood if we consider that but a comparatively short time ago there were practically no means of communication in India except in the vicinity of navigable rivers. New lines will undoubtedly now follow in quick succession, since, as a general thing, each new one that is opened actually creates a demand for another.

The success of the experiment of establishing communication by means of the telephone between New York and Cleveland, a distance of 650 miles, and later between New York and Chicago, a distance of 1050 miles, has been extensively commented upon, and appears to have been mainly due to the low resistance of the wire employed. The latter was of steel, coated with copper, the former imparting greater tensile strength and the latter conductivity. This compound wire, as some of our readers may well know, is not a new invention, and has already been found to give very satisfactory results in other directions, the copper being deposited by electro-plating. The line over which conversation was held in the instance above referred to passes two rivers by cable, and through the remainder of the distance is strung upon poles with the ordinary insulators.

The constantly increasing popularity of the telephone is well shown by recent statistics giving the number of these instruments in different cities of Norway. It appears from these that telephones were introduced into that country some two years ago, since which time there has been a rapidly-increasing demand for them. So far as the number of instruments in use is concerned, it appears that the city of Christiania has a central station of the International Bell Telephone Co., embracing 700 subscribers. The city of Drammen has a central station, with some hundred subscribers, while stations are also located in Trondhjem, Bergen, Stavanger and Arendal. Even the smaller cities are now making active preparations to introduce the telephone, as, for example, Frogrunden, which has only about 3000 inhabitants. In

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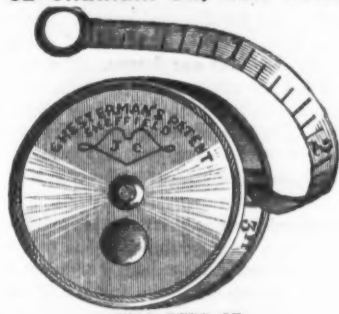
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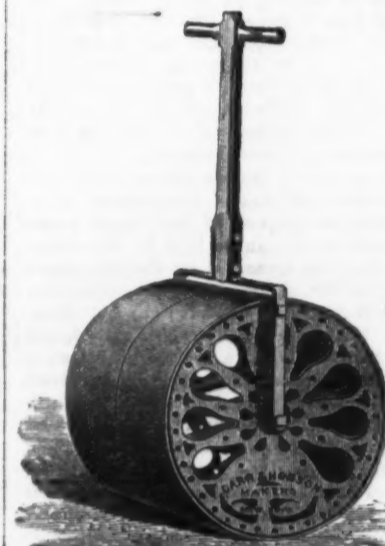


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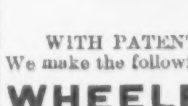
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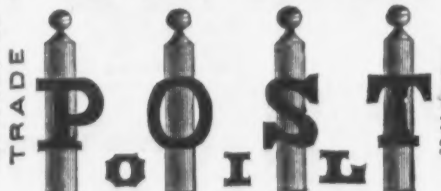


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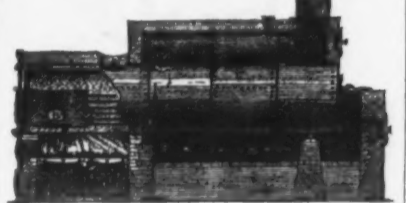
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addition to these different lines there are, moreover, an appreciable number of private telephone lines, the largest of which is one between the three cities of Prossnau, Drevig and Langesund, the length being somewhat over two miles, and which connects the main office of one of the steamship companies with its several branch offices.

Recent Methods of Towing on Rivers and Canals.

The following article by J. Klett, from *Zeitschrift für Technische Hochschulen*, republished in *Van Nostrand's Magazine*, contains a good deal that is of interest "if true." We give it, because, so far as foreign matters are concerned, the statements are apparently exact. The references to the Baxter boats show a very complete misunderstanding of the facts and an ignorance of what is going on in this country. The Baxter boats, we believe, have been superseded, but not by wire-rope tugs or towing, and though the Baxter boats were the outcome of competition, there was no mention of the necessity for doing away with a swash or swell. Authors and inventors have apparently got the idea that a swell is inadmissible on a canal, and that to obviate it great inventive effort is called for. We do not know how this idea started or how many inventions have been directed to this purpose, but they are very numerous. The commissioners who had the Baxter competition in charge, we think repeatedly published statements that no attention need be paid to abating the swell caused by the passage of a boat, as it was of no consequence whatever. There are steam yachts on the Erie Canal that cause a greater swell than any paddle or screw canal boat ever did or is likely to do. The harm they can do is so small as not to be worth attention. The following is the article to which we have referred:

In the earliest experiments made on the Elbe, in 1720, a hempen rope was fastened on shore, the other end wound upon board, and vessels propelled in this way, and nothing better than this rough system obtained for a hundred years, when, in 1820, Messrs. Tourasse and Courteaut designed special flat-bottomed tugs 75 feet long and 17 feet wide, with a horse capstan for winding up the rope, and subsequently (on the Seine) a 6-horse-power steam engine was substituted for the horse capstan. Chains next took the place of hempen ropes, and between 1820 and 1830 many chain tugs were employed on French rivers; but the first systematic service was carried out in 1846, between Paris and Montreuil (65 miles), with tugs designed by Mr. Deitz, which, in their essential parts of construction, are similar to those in use at the present day. These tugs drew 18 inches of water, and were fitted with engines of from 35 to 40 horse-power, actuating the drum on which the chain was wound, two sets of gearing being provided for going up and down stream respectively. The boiler pressure was 5½ atmospheres, and the expenditure of fuel 5½ pounds per horse-power per hour. Subsequently the chain was laid further up the Seine, and also applied to other rivers in France.

In Germany, in 1866, chain tugs were running on 200 miles of the Elbe, and in the next 10 or 12 years this system was in use on the Saale, the Brahe and the Neckar. The Elbe tugs are 138 to 150 feet long, 24 feet wide, with 18 inches draft. On the other rivers they are somewhat smaller. The sides are of ¼-inch iron plate, and formerly the bottoms were of ½-inch iron, but now they are built of 4-inch pine planks, as suffering less from abrasion on dragging over a rough bed. There is a rudder at each end, the wheel being amidships. The engines are from 60 to 70 horse-power, and work with a pressure of five to seven atmospheres, with expansion and partial condensation. In slight currents a single drum is sufficient, the chain being kept pressed against it by rollers, and the drum nicked to prevent the slip of the chain; but ordinarily there are two drums, to which the engine power is transmitted by two sets of gearing with different rates of speed—one for working up stream with great power and small speed; the other, down stream with less power and greater speed. Projecting over each end of the tug are booms furnished with guide-rollers for the chain; these booms increase the facility of steering.

The chains are from ¾ to 1 inch thick. When fractures occur, which is seldom, it is generally at the moment of the chain being first wound round the drum. Each drum is fitted with a brake, and at the ends of the booms are clips to prevent a running out of the chain in case of the brake failing to hold. Chain-towing has so increased on the Elbe that in 1874 there were 28 tugs running regularly between Hamburg and Aussig (420 miles). On the Neckar, at the same period, five tugs were employed on 56 miles of chain, and this was to be extended for 30 miles more, from Heilbronn to Cannstatt. Experience has shown that chain tugs have great advantages over paddle tugs even in smooth water, for in the latter 60 to 70 per cent. of the power is lost in slip, and another great advantage of chain-towing is that there is no wash or swell.

The charge for transport averages about ¼d. per ton per mile, which is twice as cheap as the lowest railway charges. In 1865 M. de Mesail, a Belgian, introduced a system of transport where a wire rope was substituted for the chain. This was taken up and improved by a German engineer, Max Eith, of Würtemberg, and worked with great success on a 40-mile section of the Maas (from Namur to Liege). It was subsequently employed on canals in Holland and Belgium, and also on the Rhine, and resulted in 1870 in the formation of a wire-rope tug company under the management of Mr. T. Schwartz. Extensive trials were also made on the Danube about the same time with very satisfactory results, the useful effect being 77 per cent. In 1873 the above company laid down the line from Bingen to Rotterdam, but worked the upper section only themselves, viz., from Bingen to Ruhrort (155 miles). From Ruhrort downward a concession was granted to a Dutch company, who employed a special kind of tug in which the rope passed over drums inside the vessel, similar to the chain-tug system; but the usual arrange-

ment of having the rope outside the tug is most convenient, as it enables it to be easily cast off and taken up again when two tugs meet.

The rope used on the Rhine is formed of 49 wires 0.189 inch in thickness, is 1.7 inches in diameter, and weighs 4¾ pounds per yard. It costs 10d. per foot, which is about one-third the weight and cost per foot of an iron chain of equal strength. Wire-rope tugs are also employed on the Oder and the Neva, and on the Erie Canal they have almost superseded the celebrated Baxter steamboats. The first wire-rope tugs at work in Holland and Belgium had a 20-horse-power engine for the driving-wheels and another 10-horse-power engine to work a screw when going down stream clear of the rope. At each end, outside the tug, are guide-wheels to keep the rope clear of the vessel, and at the center are two large wheels which lead the rope on to a Fowler's clip-drum, against which it is kept pressed by small rollers. (To pick up the rope and pass it over the wheels and drum takes a quarter of an hour.)

The Danube Company's tug Nyitra, to which the Rhine tugs are very similar, is 140 feet long, 24½ wide, and draws 3½ feet of water; the clip-drum is 10½ feet, and the adjoining wheels about 9 feet in diameter. Against a current of 4½ feet per second it can draw eight barges, with a total load of over 2000 tons, at a speed of three miles an hour, with useful effect of 77 per cent. The greater flexibility of the chain. Fractures of the rope seldom occur, in spite of the rock bottom in certain sections, and the life of a wire rope may be taken at from four to six years. Wire-rope tugs cannot work in less than 3 feet of water, or only with difficulty, whereas chain tugs can work in half that depth. As regards steering facility they are equal. The delay caused by fractures is an important item in the comparison, and repairs to chains occupy considerably less time than repairs to wire ropes. To sum up: Chain tugs in depth under 3 feet and in sharp curves are preferable to rope tugs; in moderately strong currents and larger curves they are about equal; but in canals and in large, deep rivers, rope tugs are best, and both are superior in ordinary circumstances to paddle tugs. In canal tunnels, as in the four-mile section (Monts to Paris), where steam cannot be used on account of the smoke, chain tugs worked by a horse capstan tow a barge through in one-third the time and at one-fourth the cost of the former system when men were employed for towing.

On the Rhine and Saone, where particularly strong rapids are met with, special steamers called "grapins" are employed. The "grapin" is an iron wheel of about 20 feet in diameter and 17½ tons weight, furnished with projections or picks, fixed in a well-hole at midships, and worked by a chain attached to the paddle shaft. On ascending a river the "grapin" is lowered till the picks grip the bed on which the wheel slowly turns, and the paddles working at the same time, in this way tow barges over the strongest rapids. Huet's water locomotive and Busquet's tug are worthy of mention; the latter works on a chain, though it is similar to a wire-rope tug. The Baxter steamboat, mentioned above as being in use on the Erie Canal, was the outcome of a competition invited by the State of New York for a prize of \$20,000 for the steamer which best fulfilled the following conditions, viz.: A mean speed of 3 miles an hour with a load of 200 tons, small cost, and no wash or swell. This steamer is 100 feet long, 17½ feet wide and about 9 feet deep, with flat bottom and vertical sides, and including engines and coal weighs 52 tons, carries a load of 200 tons, with a draft of 6 feet of water, and has an average speed of about 4 miles, but can work up to 7½ miles an hour. On the Saar Canal Jacquet's steam-tug system is in use, where the screw is within the body of the vessel and surrounded by a cylinder, and is fed with water by two large channels leading from the sides of the vessel to the front of the screw.

LABOR AND WAGES.

It is likely that there will be a strike among the coal miners at Braidwood, Ill., and vicinity, the associated operators having announced a reduction of 5 cents per ton.

A general strike of coal miners in the Hocking Valley began on April 19, against a reduction in wages of 30 cents a day. Miners at Straitsville are all out.

There has been nothing materially new developed in the question of wages now pending between the iron manufacturers and the Amalgamated Association. The latter is advocating an amicable adjustment of the question, and it is hoped that this will be reached without difficulty.

A strike is probable at the pipe mill of the Reading Iron Works, the proprietors having refused the request of their employees for an advance.

A prominent and interesting feature in the approaching Amsterdam Exhibition will be the Colonial Section, in which will be shown specimens of the production and resources of the entire colonial world. It will comprise examples of everything interesting in the natural history of the different colonies. A second category will comprehend a complete collection of objects illustrative of the civilization of the tribes and peoples indigenous to the several colonies, their manners, customs, domestic economy, arms, dress, &c. A third group will consist of everything of use or interest in colonial enterprise—the appliances of travel or exploration, the military equipments, manufactures, coinage, &c., of the European settlers.

The large Havana hardware firm of Pedraja & Planella some time ago suspended payment, and now it is learned both partners have fled because of a discovery that they had raised a sum of money on notes for large amounts against small sales to shopkeepers whom they had established in business. The liabilities are said to be \$300,000 in excess of the reported capital of the firm.

SCIENTIFIC AND TECHNICAL.

Temperature of Flames.

According to the *Annales de Chimie et de Physique*, M. Rosetti has recently made an interesting series of experiments relating to the temperature of the flames emitted by ordinary gas burners, Bunsen burners and the electric light. The determinations were made by means of a thermo-electric pile and a delicate reflecting galvanometer, and the results recorded were as follows: With the temperature of the air at 59° F., the ultimate temperature of the blue flame at the outer edge of the surface of a fan-tail gas burner was 2370°, while that of the interior white flame was 2200° F., the average temperature of the flame being 2170°. The temperature of the flame of a Bunsen burner was found to be 2280° F., while the electric light gave as a maximum of heat: For the positive pole, 7050°; for the negative pole, 5700°, and for the arc itself, 8700° F.

Prince Rupert's Drops.

Many of our readers who have tried the experiment of making the well-known Prince Rupert's drops according to directions generally given in text-books on chemistry—that is, by allowing drops of molten glass to fall into cold water—will probably have found considerable difficulty in carrying out the experiment successfully, the drops invariably breaking into small fragments on reaching the bottom of the vessel. In order to obviate this difficulty the following method has been recommended by Mr. J. Taylor: He says that the drops can be easily obtained by using a saturated solution of ammonium chloride freshly prepared with cold water—from 42° to 46° F.—contained in a cylinder about 18 inches long. The increased specific gravity and low temperature insure the almost complete cooling of the glass globe before it reaches the bottom of the cylinder.

Mine Ventilation Indicators.

One of the best-known instruments for the purpose of registering the state of the ventilation of a mine, says the *London Mining Journal*, is that known as Bailey's automatic ventilation recorder, which does its work with the greatest accuracy, and can be always relied upon. The apparatus is in appearance similar to the old-fashioned eight-day clocks, in a case of some height, and having a clock-dial with the hour, minute and second hands, the mechanism of the clock driving a drum having on its face a paper diagram which is removable. The paper diagram is divided into columns for each day, and these are sub-divided again into places for hours and half-hours, while the drum itself only makes one revolution a week. Below the clock there is a smaller dial, which goes up to 100 millions, and below it, inside the case, there is a copper float in a syphon cistern, where the ventilation is obtained by means of a fan. A small shaft in connection with the speed indicator is attached to the engine which drives the fan, and for every 1000 revolutions made by the engine, a prick and hammer strike a place on the diagram, so that a record is thus obtained of the speed at which the engine has kept working. Then by simply counting the number of marks upon the diagram the number of revolutions made in any specified time during the day or week is at once seen, while the total number will be shown on the counting dial below. The air-pressure variation is shown by means of a 1/4-inch bore tube connected to a cock and tap and attached to the fan. This is so arranged that, according to the pressure obtained in inches or tenths of an inch through the tube upon a column of water contained in the lower part of the case, a pencil marks upon the drum diagram the various fluctuations of the speed of the engines—a record upon the diagram of the varying differences of air-pressure resulting from the ventilating fan. By this means there is no necessity for visiting the mine for the purpose of seeing the amount of air that is circulating in the workings, this being effectually done by the automatic or self-registering apparatus accurately recording the periodical revolutions of the fan. But such instruments may be so devised as not only to give the total amount of air passing through a mine, but give the quantity in each of the principal roads. This has been done by means of a permanent bar magnet attached to an anemometer and an insulated wire.

There is an arrangement by which at each tenth revolution of the vanes a small steel spring is caused to vibrate near to the pole on which the wire is fixed. At each vibration of the spring a current of electricity is induced in the coil of the wire, owing to the vibration of the spring having disturbed the magnetism of the permanent magnet on which the coil was wound. The wire from the anemometer being taken from the bottom of the shaft up to the offices on the surface, is connected with a telephone. There are various ways by which the revolutions can be counted; but every tenth revolution is chosen, because it would be impossible to count every revolution of the anemometer when running at a high speed, and for all practical purposes every tenth revolution will be found all that is necessary where the wires are used. They can be protected by 1/4-inch pipes, while those in the shaft could be carried on insulators fixed in the walling, and on the surface carried along by ordinary posts. These are most effectual, and at the same time simple, means for persons on the surface being kept well acquainted with the state of the air passing in a mine without the slightest trouble, and at all times, and acts as a most effectual check on the operations of those persons in a mine who are in charge of the ventilation. Were such a system carried out, more especially in connection with mines that are known to give off considerable quantities of gas, there would be no necessity for having to descend into the workings to measure the air, or to frequently consult the barometer. The ventilation, indeed, would be kept up to the maximum at all times, for those who had the management of it would be aware of the fact that any shortcoming on their part would be seen on the surface, so that the instrument would not only be an indicator, but a detector as well.

Vibration of Solid Bodies in Contact With Liquids.

Recent investigations as to the effect of liquids contained in glass vessels upon the pitch of the sounds produced when the latter

are set in vibration have yielded the following results: 1. The geometrical lowering in pitch (ratio of number of vibrations) produced by a liquid contained in a cylindrical glass completely filled by it is less in proportion as the pitch of the empty glass is higher. 2. The arithmetical lowering of pitch with a cylindrical glass of mean pitch is approximately proportional to the reciprocal of the square root of the number of vibrations of the empty glass. 3. The lowering of pitch, when the glass is completely filled, is not noticeably dependent on its height. 4. The geometrical lowering of pitch produced in cylindrical glasses of different widths is greater in proportion as the glass is narrower. 5. The arithmetical lowering of pitch with cylinders of different widths is inversely as the square root of the width. 6. The arithmetical change of pitch is inversely proportional to the square root of the number of wave-lengths of the sound given by the empty glass contained between the walls and axis of the cylinder. 7. The lowering of pitch is greater as the density of the liquid is greater. 8. It is greater in proportion as the compressibility of the liquid is less.

Vibratory Movement of Bells.

M. Mathieu, a French experimenter, has recently studied the vibrations of bells, considering the case of an ordinary bell in which the thickness in any meridian increases from summit to base. The essential difference between the vibratory movement of a bell and that of a plane plate is that, while in the latter the longitudinal or tangential movement and the transverse movement are given by independent equations, the normal and tangential motions in the former are given by three equations which are not independent. The pitch of the notes of a bell does not change if the thickness varies in the same relation throughout every part, since the terms depending on the square of the thickness may be neglected, at least for the graver partials. It is impossible to construct a bell so that it shall vibrate only normally, and with a hammer the tangential vibrations are of the same order as the normal vibrations. A purely tangential motion can be realized only with a spherical bell of constant thickness.

Electrical Resistance of Copper Wire.

In answer to frequent inquiries as to the electrical resistance of copper wires of different diameters and lengths, *La Nature* says that a pure copper wire 1 m. long and 1 mm. in diameter has a resistance of 0.02 ohm at 0° C. If, now, we have a wire of a length l (in meters) and a diameter d (in millimeters), its resistance r at the same temperature is represented by the formula:

$$r = \frac{0.02 \times l}{d^2} \text{ ohms.}$$

Applying this to a wire having a length of 25 m. and a diameter of 0.4 mm., we have:

$$r = \frac{0.02 \times 25}{0.4^2} = 3.125 \text{ ohms.}$$

Pure copper, however, is difficult to obtain in commerce, the best quality, for dynamo machines, &c., having a conductivity of from 93 to 98 per cent. The conductivity of ordinary copper wire varies between 70 and 90 per cent., often, in fact, falling as low as 50 per cent., and less. It is therefore not at all surprising to find an ordinary copper wire of the above dimensions having a resistance of, say, 6, 7 and even 8 ohms, in place of 3.125 ohms, corresponding to a temperature of 0° C. Increase of temperature increases the resistance of pure copper by about 38 per cent. for every degree C. Thus, for example, a wire having a resistance of 3.125 ohms at 0° C. will, at a temperature of 15° C., have a resistance:

$$r = 3.125 + \frac{3.125 \times (0.38 \times 15)}{100} = 3.303 \text{ ohms.}$$

If, in place of knowing the diameter of the wire, we have its section in square millimeters s and its length in meters l , then the resistance r is found from the formula:

$$r = \frac{0.0162 \times l}{s} \text{ ohms.}$$

In using this formula, however, it should be remembered that the wire is assumed to consist of pure copper and to be at a temperature of 0° C.

The Gulf Stream.

Commander Barlett's recent measurements on the Coast-Survey steamer *Blake* show that the current off Florida, where the channel is 48 miles wide and the greatest depth 439 fathoms, has a cross section of 429,526,240 square feet; a velocity from 1 to 5, average 3 miles per hour; a discharge of 51,000,000,000 gallons an hour, and a temperature varying from 78° to 83° at the surface and from 57° to 44° at the bottom. Further along our coast the current flows over an even plateau, narrowing toward Cape Hatteras, about 400 fathoms deep, and suddenly dropping off to over 2000 fathoms at its eastern edge. In the stronger parts of the stream the bottom is swept clean, and consists of firm coral rock, hard enough to dent the brass cylinder of the sounding apparatus. Where fine deposits occur south of Charleston, they are of pteropod ooze, characteristic of the Caribbean Sea and Gulf of Mexico; further north globigerina ooze becomes more common, as it is in the open North Atlantic. The division between these two deposits is considered the boundary of the cold, arctic current which follows down our shore from the north, passing under the Gulf Stream off Hatteras, where the shallow plateau forces it out. No warm and cold bands or bifurcations were found in the surface waters till off Hatteras, and no distinct "cold wall." Near shore the current was much influenced by winds.

The Yale & Towne Mfg. Co.—The Yale Lock Co., of Stamford, Conn., have changed their name to the Yale & Towne Mfg. Co. The reason for this change is that the company have outgrown their former designation, and in their more recently added branches have been somewhat handicapped by a corporate name which identified them rather with the hardware than with the engineering trades. During the past seven years the company have built up a large business in hoisting machinery, including cranes of the largest size, and have now undertaken to manufacture the testing machines of A. H. Emery. They have also

undertaken the manufacture of scales and of pressure gauges. The new organization owns and controls the Yale Lock Co., the Weston Crane Co. and the Emery Scale Co. The plant and buildings have been extended to include facilities for all these lines of manufacture, making it a very extensive and complete establishment. The officers of the Yale & Towne Mfg. Co. are: Henry R. Towne, president; Schuyler Merritt, secretary; W. T. Payne, assistant secretary; George E. White, treasurer; Thos. F. Keating, assistant treasurer; R. C. Cornelius, general superintendent. Of the Yale Lock Co., Messrs. W. H. Taylor and E. Stockwell are superintendents; of the Emery Scale Co., Mr. A. H. Emery is vice-president and engineer; of the Weston Crane Co., Mr. T. W. Capen is mechanical engineer. Mr. Thos. F. Keating manages the New York office at 62 Reade street; Mr. A. T. Young the Boston office at 224 Franklin street; Mr. Merle Middleton the Philadelphia office at 507 Market street, and Mr. Wm. F. Donovan the Western office at 64 Lake street, Chicago.

The Pacific Iron and Nail Co.

This company, which was organized about two years ago with a capital of \$500,000, started their works on the 13th inst. The works are located on San Francisco Bay, where ten acres of salt marsh, on Oakland Creek, at Market street, had been purchased for the purpose. Ground was broken last August. A large part of the land was filled in to a depth of 4 feet to provide yard room and sites for the buildings. A wharf was constructed 800 feet in length, and a ship channel dredged up to it, carrying a depth of 21 feet of water. Railroad tracks were laid connecting the works with the main line of the Central Pacific, which passes only a short distance from the buildings; also out to the end of the wharf, where cargoes of coal and iron are discharged from deep-water vessels directly into the cars of the company, to be transferred to any part of the premises, while Central Pacific Railroad cars can be loaded directly from the packing-room and warehouse for shipment to any part of the coast. Operations are carried on at present in three buildings, namely: The rolling mill, 100 feet by 160 feet; the nail mill, 66 feet by 130 feet, and the machine and blacksmith's shop, 40 feet by 60 feet.

The rolling mill contains a blooming train and two plate trains, driven by 30 x 40 inch Corliss engine of 500 nominal horse-power. The furnaces occupy two sides of the building, the waste heat from them being utilized for the generation of the steam required for all the different engines in the mill. The scrap shears, the hot-bloom shears and the plate shears are each driven by special engines. All of the machinery was constructed by Messrs. Hinkley, Spiers & Hayes, of San Francisco, after designs by Mr. Davis, the mechanical engineer of the company. The nail plate is made of scrap iron mixed with old rail, of which stock the company has now 5000 tons on hand, 1500 tons of which came from the Government works at Bombay. The supply of scrap iron on the Pacific coast is not equal to the demands of these and other works; hence the heavy drafts on foreign countries. But there is also another reason for importing it. On all nails exported, if made from imported iron, the Government allows a rebate equal to the duty paid on the iron, which amounts in this case to about 40 cents per keg. The coal used is Australian Bullei, 6000 tons of which is now on hand and afloat.

The nail mill is provided at present with 62 automatic self-feeding and eight hand-feeding nail machines arranged in two rows, as close together as they can stand, the whole length of the building. Occupying two wings of the building, one on each side of the row of nail machines, are the two attending furnaces, where the plates designed for the nails above the sixpenny size are heated preparatory to cutting, all sizes smaller than sixes being cut cold. Along each side of the room are two rows of grindstones, 26 in number, 5 or 6 feet in diameter and a foot thick, and in constant motion, with several men in attendance whose duties are to sharpen the cutters of nail machines. The finished nails drop through an opening in the floor into the bins in the packing rooms below, where, after being carefully examined, they are put into kegs of 100 pounds each and are ready for market. The kegs are now made by the Matulath Mfg. Co., of San Francisco, but will soon be made at the works. The nail mill is driven by a special upright engine entirely distinct and independent of the other departments of the works. In fact, this independence of one department from another has been made a feature of the entire establishment.

A site is being filled in for a cooper shop, to be built shortly, after which all the kegs will be made on the premises. Although the capacity of the works are now 740 kegs of nails per day, the company are building additional machines in their own shop, and by another year the number in operation will be increased to 100. With this number they expect to be able to supply the present demands of their market, which amounts to about 300,000 kegs per year. If at any time the supply of scrap iron obtainable runs short, the company are prepared to erect puddling furnaces and thus make available the superior charcoal pig iron now turned out by the Clipper Gap and other Pacific coast smelting furnaces.

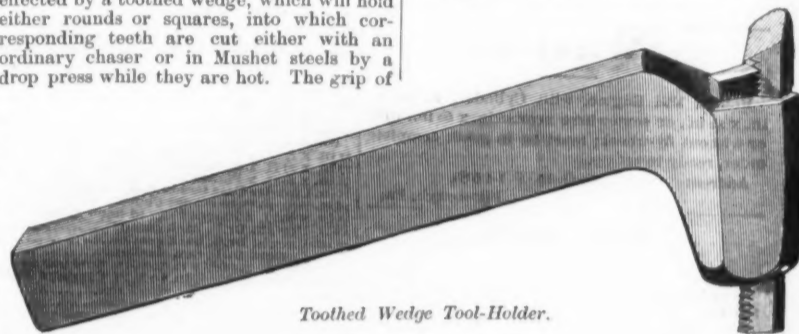
The present officers of the company are: P. A. Wagner, president; Asa Harker, vice-president; G. G. Walker, superintendent; and Messrs. W. J. Houston & Co., who were the originators of the enterprise, are appointed the general agents of the company.

Improved Leather for Valves.—Almost every one who has had anything to do with leather valves, whether in connection with blowing engines or other machinery, knows the difficulties attendant upon the use of ordinary leather for the purpose. Various substitutes for leather have been tried, among which may be mentioned rubber in various shapes, but serious objections to all have been evident, even on slight trial, and the demand for a really good article for this purpose is widespread. The Shultz Belting

Co., of St. Louis, are directing attention to their patent fulled leather, which by its characteristics possesses many advantages for such uses. In positions where ordinary leather has in a few days broken off by the hinge-like motion to which valves are subjected, valves made of fulled leather have proven very durable. A peculiarity of fulling is that the material thus produced becomes softer the more it is bent and worked. We understand that the Cambria Iron Co. in September last placed valves made of this material in the most severe parts of their engine, and that up to a very short time since they were still in use and were working satisfactorily. The statement is made by the general manager of the company that valves made of ordinary leather in the same position only last a few days. From the fact that valves made of this material, wherever introduced, have given very great satisfaction, it would seem that the employment of leather of this kind for the purpose was a matter in which iron manufacturers generally are interested.

Toothed Wedge Tool-Holder.

The difficulties experienced in working the so-called "special steels" into shape for cutting tools occasioning very frequently, through the carelessness or ignorance of the blacksmith, serious losses and delays, have created a demand for tool-holders which make it possible to use these steels as they come from the manufacturers without further forging and tempering. Mr. John F. Allen, of 137th street and College avenue, New York, has endeavored to meet this want by his patented toothed wedge tool-holder, of which we present herewith an illustration. This tool-holder is made of cast steel, and the grip upon the cutter is effected by a toothed wedge, which will hold either rounds or squares, into which corresponding teeth are cut either with an ordinary chaser or in Muesel steels by a drop press while they are hot. The grip of



Toothed Wedge Tool-Holder.

the wedge is naturally always in proportion to the work of the cutting tool, and the release of the tool, for changing or grinding it, is promptly effected by a light tap on the end opposite its cutting edge. The cutters as well as the wedge being toothed for their entire length, the whole strength of the surrounding metal is brought into play by means of the wedge. These holders are made with right, left or straight shanks, and are of different sizes, varying from 7-16 x 3/4 x 8 1/2 inches length of shank, up to 1 1/4 x 2 1/4 x 1 1/2 inches length of shank, and for the accommodation of round or square cutters from 1/4 inch to 3/4 inch square.

Manufactures in San Francisco.

"San Francisco," says the *Journal of Commerce* of that city, "possesses some very great advantages as a manufacturing center. By sea she has a vast area of distribution, which is available as soon as goods of sufficient worth and ability to compete in price with other cities and peoples are produced. By land it is only a question of good river and rail communication. Our position on the shore of the greatest ocean in the world gives us peculiar facilities in obtaining raw materials needed in every branch of art and manufacture. Great Britain obtains raw cotton from all the countries of the world; we have a great number of people whose countries produce it, or can produce it, at our very doors. Western Mexico and Southern California, as well as Tahiti and other sea islands, can grow it in almost unlimited quantity. China produces it—India also, and Queensland, in Australia. Raw silk, for the supply of New Jersey and other manufacturing States, passes our very doors in transit, and can be laid down here cheaper, while our friends of the Silk Cultural Association contend that California itself can produce it in large quantity and of the finest quality, though they look to other places in which to find a market. Oregon, Washington Territory and California grow some of the finest flax in the world. The wool of the Pacific Slope cannot be surpassed, and we can have it in almost unlimited quantity. Here are materials at the basis of the manufactures of textile fabrics, the most important of any other in the world, at our very door, inviting us, as it were, to use them. Besides producing hides, we have all the countries on the Pacific as sources of supply, notably Australia, and can even go to Atlantic countries for them. Hence follow the numerous varied and important branches of manufactures in leather. The rest of the Union will soon have to look to this coast for lumber; we have the raw material handy to build all the fleets, all the houses, all the furniture and all the other wooden-work in the world. The discovery of inexhaustible deposits of iron, as well as of anthracite coal in abundant supply, gives us the raw material of one of the greatest, next to the textile branch, of all the manufacturing industries of the day. Our barley is sought by both England and the East for purposes of brewing, which shows that this industry has a great future before it in this city. With capital and raw material in any quantity, all that is needed is skill and energy, and they will not long be waiting."

The passenger engineers on the New York, Lake Erie and Western Railroad are being furnished with a small box of appliances to be used in case of accidents. They are requested to carefully read the instructions which accompany the box, in reference to the proper treatment of injured persons, to have their firemen do the same, and to keep the box constantly on the engine, where it can be obtained at a moment's warning. The

box contains broad and narrow bandages, with safety pins to fasten them, a compress of dressing cotton covered with cotton-gauze, hemostatic cotton to stop bleeding, surgeons' plaster for use in bruised wounds to draw parts together and permit healing by first intentions, a bottle of soothing ointment for cuts, burns, scalds, &c., and a bottle of tincture of arnica. The little pamphlet which accompanies the box gives minute descriptions how to bandage any part of the body, and illustrates the same by a number of cuts.

The Canal Age.

Apropos of the movement at present in progress for the construction of the ship canal between Liverpool and Manchester, a writer in an ably-conducted North of England paper very pointedly draws attention to the probability of the remaining years of the nineteenth century being spoken of in history as "The Canal Age," his opinion being that the present indications are in the line of a large extension of inland water carriage by means of canals, and that the problem of quick international communication has now been solved, almost to "finality," by steamships and railways. Whether or not finality has been reached by those two great civilizing agencies, it is undoubtedly the case that the prospects of canalization on a great scale for the immediate future bulk very largely in the eyes both of commercial men and of engineers. Not only is there in hand the project of the Liverpool and Manchester Ship Canal, with its probable cost of £6,000,000, estimated to make an income enough to pay the shareholders if only a single ship of 4000 tons pass both ways every day, but there are also various other great inland water way schemes, of

national and international importance, either in hand or actually carried into execution. The sum of £40,000,000 has recently been voted by the French Parliament for inland canalization works, and it is thought that at least five times that sum will have been spent upon such works before the system of inland water carriage in France has been completed. Many of our readers are familiar with the great engineering works which have resulted in the completion of a ship canal connecting the city of Amsterdam with the sea, and they scarcely require to be informed that it has proved to be a remarkable success, commercially and otherwise. Additional canals are likewise in course of construction or projected in Belgium, a country well adapted by nature for such works. Then, going into Prussia, we find that there is a prospect of a speedy beginning with the canal scheme which aims at connecting the Rhine, the Weser and the Elbe, at an estimated cost of upward of £7,000,000. Proceeding further east we should notice another proposal which bids fair to become an accomplished fact in the early future, which is a scheme to cut a ship canal to connect the River Danube with the Oder, and thereby joining the Black Sea with the Baltic. But in Russia it is proposed to enter upon even a much larger canal scheme, to wit, one to connect the river Dnieper with the Vistula, and thereby to bring the great ports of Odessa and Danzig into direct communication. One of the probabilities of the next few years is an Egyptian project, namely, a great inland waterway to rival the Suez Canal, and a ship canal through the Isthmus of Panama may be regarded as one of the certainties of the immediate future. More or less similar schemes are likewise contemplated in other parts of the world—in Canada, in Southern Europe, Southern Asia, &c.

The Growth of Canadian Industries.

—In advance of the third volume of the census, we have some interesting figures in relation to the growth of industrial enterprise in the Dominion during the past decade. The total amount of capital invested in industries was, in 1871, \$165,302,623, or more than double the amount in 1871, and this capital was distributed as follows: Ontario, \$30,950,847; Quebec, \$59,216,992; Nova Scotia, \$10,183,060; New Brunswick, \$8,425,282; British Columbia, \$2,952,835; Prince Edward Island, \$2,085,776; Manitoba, \$1,383,331; and Northwest Territories, \$104,500. Taken in connection with the increase in the value of the products of the industries of the country, says the *Montreal Gazette*, "the inference appears to be that a large amount of capital was invested during 1879, 1880 and 1881, which at the time of taking the census had not become productive, because, while the capital invested has increased 103 per cent, the value of products has augmented only 35 per cent. In the Dominion the products of industries in 1881 reached a total of \$309,676,068, of which \$3,413,026 were in Manitoba, \$3,400,205 in Prince Edward Island and \$2,926,784 in British Columbia."

According to an exchange, Professor Lawton gives the following definition of the terms "stamp," "barrel" and "mass," as applied to the copper product of the northern countries: "Stamp copper is the fine copper that is washed from the stamped rock in which it is interspersed, in the same manner in which gold is obtained. By 'barrel work' is meant the smaller masses of copper, not too large to be packed for transportation in a barrel, and by 'mass copper' those masses which are too large to be so handled. Some of these masses are of enormous weight, one having been found weighing over 500 tons."

Special Notices.

Bargains.

Bargains.

NEW BOILERS,

Three to Sixty Horse-Power.

ENGINES,

Three to Forty Horse-Power.

LOVEGROVE & CO.,

152 N. Third Street,
PHILADELPHIA, PA.To Manufacturers of Machinery, Steam
Engines, Hardware, or others using
Iron Castings.

We solicit correspondence from such as are seeking a location, as we can furnish Land & Buildings on the railroad track, in one of the very best railroad and manufacturing centers in New England. Having ourselves complete facilities for making a superior quality of castings, we desire to supply the same to parties who may locate near us.

SPRINGFIELD FOUNDRY CO.,
Springfield, Mass.

Wanted.

Rolling Mill Engine, with Cylinder, 20 or 22 in. x 40 in., or somewhere near 26 in. x 60 in., with or without fly-wheel; must be in good, complete order, ready to set up.

Address P. O. BOX 1158,
Pittsburgh, Pa.

For Sale.

Worthington Duplex Tank Pump, 14-inch steam, 14-inch water, 10-inch stroke.
One hundred ton Hydraulic Press, with hand-pump complete.
Three heavy Screw Presses, 4-inch screws.

Address Ledger Building, Philadelphia.

\$15,000

will buy one of the best Hardware Stores in Eastern Pennsylvania. Business last year, \$65,000. Can be increased. Only those meaning business need address, giving full name. Communications strictly confidential.

Address A,
Office of The Iron Age, 220 S. 4th St., Phila., Pa.To Brass Foundries.
To Brass Manufacturers.Our new foot press, for cutting off GATES from brass castings by FOOT power, is now ready. Weight, 250 lbs. Price complete, \$50. net. A boy can operate it easily. We warrant them to give the most perfect satisfaction. FERRISS PUNCH AND SHEAR CO.,
35 W. 2nd Street, New York.

E. BISSELL & CO.,

Wholesale Hardware Auctioneers,

83 Chambers and 65 Reade Sts., N. Y.

Sales held weekly for the trade. Consignments solicited. We refer to the leading manufacturers and importers.

F. A. ROWLEY,

recently employed by us as traveling salesman, we have discharged for causes we will explain on personal application to us.

CORNING & CO.,
Albany, N. Y.

To Exchange.

A party owning the machinery complete of a
PLATE AND SHEET MILL,

will exchange the same for improved or unimproved property desirably situated, at fair cash value. Machinery cost \$100,000; all in good order.

Address 130 Dearborn St., Chicago, Ill.

Wanted.

A SECOND-HAND DROP PRESS,
Hammer about 500 pounds and about 30 inch lift.Address ST. LOUIS MALLEABLE IRON CO.,
St. Louis, Mo.

POSITION WANTED.

By an American, 32 years of age, 4 1/2 years with present employer. Thorough knowledge of Hardware and House Furnishing. Expert salesman and posted in buying. Excellent references. Disengaged May 1st. Willing to leave the city under favorable circumstances. PETER D. STARR,
Care of C. E. Little, 35 Fulton St., New York City.

Wanted.

Situation as Foreman or Superintendent of Factory or Machine Shop. Eight years' experience.

Address PRACTICAL,
Office of The Iron Age, 83 Reade St., New York.

DESIRING to engage in the exclusive jobbing trade in this city, I offer my retail stock for sale. Stock clean and in good shape. Location best in the city. Purchaser can continue in present store.

Address A. C. FAUST,
Atchison, Kan.

WANTED.—A young man having had twelve (12) years' experience in the Hardware business, both wholesale and retail, is going West about May 1st, and desires to represent some first-class manufacturers, selling goods on commission, paying his own expenses. Best of reference.

Address A, ROOM NO. 12,
Porter's Block, Easton, Pa.

STORE FOR SALE. Hardware Store in a healthy village in Tompkins County. Stock, \$20,000; sales, \$15,000 per year. Terms cash. Price, cost. Address BOX 213, Ithaca, N. Y.

Special Notices.

SECOND-HAND AND NEW

MACHINERY.

APRIL 12.

One Corliss Beam Condensing Engine, 30 in. x 72 in.
One Horizontal Corliss Engine, 16 in. x 42 in.
One Horizontal Corliss Engine, 14 in. x 30 in.
One Horizontal Corliss Engine, 12 in. x 24 in.
One Horizontal Corliss Engine, 10 in. x 22 in.
One Horizontal Engine, 12 in. x 24 in.
One Horizontal Engine, 10 in. x 22 in.
One Horizontal Engine, 8 in. x 16 in.
One Horizontal Engine, 6 in. x 12 in.
One Horizontal Engine, 4 in. x 10 in.
One Horizontal Engine, 3 in. x 8 in.
One Horizontal Engine, 2 in. x 6 in.
One Horizontal Engine, 1 in. x 4 in.
One Horizontal Engine, 1/2 in. x 3 in.
One Horizontal Engine, 1/4 in. x 2 in.
One Horizontal Engine, 1/8 in. x 1 in.
One Horizontal Engine, 1/16 in. x 1/2 in.
One Horizontal Engine, 1/32 in. x 1/4 in.
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One Horizontal Engine, 1/713623846352979940529142984724747568162011104 in. x 1/89202980794122492566142873090593446020251648 in.
One Horizontal Engine, 1/1427247692705959881058285969449495136324022208 in. x 1/178405961588244985132285746181186892040503296 in.
One Horizontal Engine, 1/2854495385411919762116571938898990272648044416 in. x 1/35681192317648997026457149236237378408100595

Special Notices.**For Sale or Lease.**

A Large Two-Story Brick Factory,
formerly Machine Works, at Pearl River, N. Y., on railroad depot, 25 miles from New York City. Railroad facilities unexceptionable, on the line of the New Jersey and New York Railroad. The property contains 40,000 square feet floor space, with one 80 H. P. Engine and Boiler, 700 ft. 2-inch line shafting and pulleys, main belts, steam heating and water pipes throughout the building. A splendid iron foundry, 70 ft. by 50 ft., with one iron smelting cupola with Mackenzie blower, brass furnace, core oven, blacksmith shop, pattern vault, annealing oven, etc. The property can be bought or leased on liberal terms. For further particulars, price, terms, etc. address
J. E. B. & Co.,
111 Liberty St., New York City,
or Pearl River, Rockland Co., N. Y.

TO MANUFACTURERS.**A GRAND BARGAIN.****A Large and Fully-Equipped Machine Shop For Sale.**

I will sell at low figures, and at reasonable terms, my magnificent Machine Works at Newark, Ohio, fully equipped with every necessary to make a first-class establishment. It stands on two acres of ground in the center of this thriving city. A railroad switch runs into the works for loading and unloading; excellent railroad facilities; cheap living; unusually healthy locality.

F. J. L. LANDY,

Zanesville, Ohio.

For Sale.

The largest stock of New and Second-hand Engines, Boilers, and general Machinery in the West. Send for Catalogue. Hoisting Outfits for Coal Mining and other purposes a specialty.

WARREN SPRINGER,

755 to 219 South Canal St., Chicago.

For Sale.

Second-hand

DROPS AND LIFTERS.

BEECHER & PECK,

Lock Box 222, New Haven, Conn.

For Sale.

Heavy Planer, 30 in. x 30 in. x 13 ft., with rack and pinion, to plane 20 ft. Good as new.
Sellers & Co. Drilling and Boring Machine, 45 in. swing, back-gear, self-feed, compound table—table raises and lowers by power.

Lever Shears to cut 2 x 2.

Lever Shears to trim 1/4 plate.

A. G. BROOKS & WINEBRENER,

261 N. 3d St., Philadelphia.

For Sale.

One slide valve stationary engine; cylinder, 30 in. x 30 in.; modern build; extra heavy bed plate; hammered wrought iron shaft, 10 inches in diameter; 10-foot band wheel, 33 inches face; 12 foot fly wheel, weighing 13,000 lbs. This engine was only used one year, and is as good as new. Price, \$1850.

Also one rolling mill engine; cylinder, 24 in. x 42 in.; poppet valve; heavy bed plate in two sections; hammered wrought iron shaft, 10 1/2 inches in diameter, and disk crank. All in good order, and good as new. Price, \$1500.

Address POPE IRON AND METAL CO.,

St. Louis, Mo.

For Sale.

A lot of Wrought Iron Piles, 50 feet long, 6 inches in diameter.

Apply, SITES & GILL,

222 and 224 South 3d St.,

Philadelphia, Pa.

For Sale.

Valuable manufacturing property situated at Philadelphia, in full operation. Business established for thirty years for manufacturing an article of agricultural implement. To a party with capital, wishing to engage in the manufacturing business, this is an opportunity seldom offered. Address P. O. BOX 2036,

Philadelphia, Pa.

CORRESPONDENCE IS SOLICITED

with parties having

MACHINERY TO BUILD,

Heavy work preferred.

Address THE HARTFORD ENGINEERING CO.,

Hartford, Conn.

J. M. BADGER,

5 Dey St., Room 13, NEW YORK CITY,

Dealer in

Iron and Wood Working Machinery.

Large lists of both new and second-hand goods for immediate delivery.

On May 1, 1883, I shall open a

NEW MACHINERY DEPOT

at No. 49 Dey St., New York, where I shall be better prepared to serve all who may be in want of anything in my line.

Wanted.

A Partner with \$5000 to \$10,000 in a Foundry and Machine Business, established in 1824. For particulars, inquire of

I. H. COLLIER,

Poughkeepsie, N. Y.

Wanted.

An old-established firm in Thames street, manufacturing especially one description of Ornamental Castings, but having warehouse too large for own use, are desirous to meet with manufacturers of other goods requiring them stocked in London and sold on commission. Apply to

203/30, care of Ironmonger Newspaper,

42 Cannon street, London, England.

Special Notices.**HENRY I. SNELL,**

135 North Third St., Philadelphia, Pa.,

has just received a fresh lot of Machine Tools,

Engines, &c., which he offers at very low figures.

One Screw-cutting Engine Lathe, 6 ft. bed 18 in.

swing.

One Screw-cutting Engine Lathe, 8 ft. bed, 18 in.

swing.

One Screw-cutting Engine Lathe, 12 ft. bed, 18 in.

swing.

One Iron Planer, planes 7 ft. long 32 in. wide.

One Iron Planer, planes 15 ft. long 50 in. wide.

One Power Crank Planer, 12 in. stroke.

One 12 in. Shaping Machine, traveling head.

One 38 in. Upright Drill, Extra heavy. New.

One 300 lb. Ferris & Miles Steam Hammer.

One 25 H. P. Corliss Steam Engine.

One 40 H. P. Corliss Steam Engine.

One 12 H. P. vertical steam Engine. Naylor.

One 60 H. P. Marine Boiler, suitable for tug boat.

One 25 in. heavy Endless Bed Surfer.

One 5 H. P. Link Motion Boat Engine.

Three Cylinder Boilers, 36 in. dia. x 30 ft. long.

One second-hand No. 7 Sturtevant Pressure Blower

For Sale.**Palo Alto Rolling Mills,**

Near Pottsville, Pa.,

ON THE MAIN LINE OF THE POTTSVILLE

AND READING RAILROAD.

These mills are in good repair, and can be

started in two days' time.

Rolls for T-Rails 12 to 70 lbs. per yard, and for

Street Rails 15 to 20 lbs. per yard.

Guide Mill Train for Merchant Iron 1/2 to 1 inch.

Rolls for Merchant Bar, round and square, up to

4 1/2 inches.

Number of Puddling Furnaces in both mills,

30; Heating Furnaces, 2 with all boilers attached.

Also Foundry, Machine Shop, Blacksmith Shops,

Iron House, Roll House, Carpenter and Pattern

Shops, Stables, handsome Dwelling for Superintendent,

11 Tenant Houses, a Brick Office, and

ample grounds for stock and cinder.

For further particulars address

Messrs. LEE & McCAMANT, Extrs.,

Pottsville, Pa.

THOS. F. WRIGHT, 1804 Race St., Philadelphia, Pa.

HUGH W. ADAMS, 56 Pine St., New York.

ROLLING MILL AT CANTON

(Baltimore City, Md.),

FOR SALE.

Under the provisions of a deed of trust from

Anderson Bros. & Co., I will sell at public auction,

on the premises, at Canton (Baltimore), Md., on

May 25th, 1883, at 1 P. M., the rolling mill lately

operated by Messrs. Anderson Bros. & Co.

The mill occupies a square of ground, with railroad

connection by a switch belonging to the

property, and is within a few squares of the Canton

Co. wharf.

The improvements consist of a rolling mill well

equipped for the rolling of merchant bar, six

double puddling furnaces (are incomplete), two

heating furnaces, one rotary squeezer, two trains

of rolls, 15 and 8 inches, with engines, pumps,

boilers, shears, fan, and other machinery necessary

for manufacturing bar iron.

The property is subject to a redeemable ground

rent of \$1500.

Purchasers will have the right to remove the

machinery and furnaces, if they so desire, upon

payment in full of purchase money.

Terms: One-third cash, balance in equal install-

ments in six and twelve months from day of sale;

deferred payments to bear interest from day of

sale; or all cash, at option of purchaser. Private

bids requested.

RANDOLPH BARTON, Trustee,

29 N. Calvert St., Baltimore, Md.

For Sale.**Bolt and Nut Machinery.**

9 Bolt Cutters, National, capacity up to 2 in.

10 Bolt Cutters, National, capacity up to 1 1/2 in.

6 Bolt Cutters, National, capacity up to 1 1/4 in.

3 Bolt Cutters, National, capacity up to 1 1/2 in.

3 Bolt Cutters, National, capacity up to 2 1/2 in.

2 each, 3 in. and 4 in.

2 National Bolt Headers, capacity up to 1 in.

1 National Bolt Header, 1 1/2 in.

1 Improved Lewis Bolt Header, capacity up to

1 1/2 in.

Several Chapin Headers, light and heavy; Nut

Tappers, a complete assortment; Cold Headers

for Rivets, Store Bolts, &c.; Hot-pressed Nut

Machines, 1 sizes; Washer Machinery, and every

variety of tool used in Bolt and Nut Shops. The

only specialists in line in the United States.

Address THE NATIONAL MACHINERY CO.,

Tiffin, O.

Catalogues sent free to any address.

For Sale.

One 22x36 right-hand box-bed slide-valve Sta-

tionary Engine, Gardner governor, band wheel in

halves, 24 ft. diameter, 24 inches face, 13,000 lbs.

weight. Wrought-iron hammered shaft, 21 inches

diameter, disk crank. A heavy substantial engine,

entirely new.

For information address

THE LANE & BODLEY CO.,

Cincinnati, Ohio.

PIPE MILL MACHINERY.

FOR SALE.—A complete set of Pipe Mill Ma-

chinery to manufacture from 1/2 to 2-inch Wrought

Iron Pipe.

One Vertical 8 x 12 Engine.

One No. 5 Sturtevant Blower, Counter-Shaft

and Hangers complete.

One lot Shafting and Pulleys.

One 4-inch Cupola, complete.

One lot new Hoop Iron, 3/4 x 15.

A. A. GRIFFING IRON CO., Jersey City, N. J.

For Sale.

No. 6 Sturtevant Blower and Countershaft.

6 Blake Steam Pumps. Good as new.

Nos. 3, 4 and 5 Phila. Hydraulic Works Steam

Pumps.

Belt Pump for Hydraulic Press.

Head & Sisco Centrifugal Pump, 4-in. discharge.

Small Steam Blowing Engine.

A. G. BROOKS & WINEBRENER,

261 N. 3d St., Philadelphia.

For Sale.

To a competent Mechanical Engineer, with ex-

perience in managing Machine Shops, an interest

in the Omaha Foundry & Machine Co., at Omaha,

Nebr. The largest and best equipped shops in Ne-

braska, with a splendid trade and no local com-

petition. Address

T. W. T. RICHARDS,

Omaha, Neb.

Trade Report.**BRITISH IRON AND METAL****MARKETS.**

[Special Cable Dispatch to the Iron Age.]

LONDON, WEDNESDAY, April 25, 1883.

Scotch Pig.—The market is irregular, and prices are lower. We quote makers' prices:

Coltrass, alongside, Glasgow	6/1
Langloan, " "	6/1
Gartsherrie, " "	6/1
Fumherlee, " "	6/1
Carnbroe, " "	6/1
Glenarnock, " " Ardrossan	5/4
Eglinton, " "	4/8
Dalmellington, " "	4/9
Shotts, " " at Leith	6/3

Lighterage from Ardrossan to Glasgow is 1/10 ton.

Cleveland Pig.—The market is a little weaker. We quote as follows, f.o.b. shipping ports:

Middlesboro' No. 1 Foundry	43/6
" " No. 2	42/
" " No. 3	40/ @ 40/3
" " No. 4 Forge	40/

Bessemer Pig.—The market is weaker. Owing to the large strike, the makers have agreed to restrict production. We quote: W. C. Hematites, lots equal parts Nos. 1, 2 and 3, 51/ @ 52/.

Blooms.—Continue quiet at unchanged figures. We quote Bessemer Blooms, 7 1/2 x 7 1/2, £4.10/ @ £5, f.o.b. shipping ports.

Manufactured Iron.—The market is irregular. We quote at works:

Staff, Ord. Marked Bars	7 10 @ 7 10
" " Medium	6 10 @ 6 10
" " Common	6 10 @ 6 10

Hoops, 20 W. G. and over.

" " Common Best

" " Medium

" " Common

Sheets, 20 W. G. and under.

" " Ordinary Best

" " Common

Welsh Bars

Steel Rails.—Are weaker. Ordinary Sec-

tions are quoted £4.15/ @ £5, f.o.b. ship-

ping ports.

Iron Rails.—Dull and nominal. Welsh, 30 lb and upward, are quoted, nominally, £4.15/ @ £5.10/, f.o.b. shipping ports.

Old Rails.—The market continues irregular. We quote Old Tees, c.i.f. New York, £3.10/ @ £3.12/6, and Old D. H's, £3.15/ @ £4, same port.

Scrap.—Is in small demand and irregular. We quote Heavy Wrought, c.i.f. New York, £3.5/ @ £3.10/.

Copper.—The market is a little weaker, and prices are lower. We quote Best Selected, £68.10/ @ £69, and Chili Bars, £62.10/ @ £63.

Tin.—The market has weakened a little. We quote Straits Ingots, spot, £96.5/ @ £96.15/, and futures, £97 @ £97.15/.

Tin Plates.—Are irregular. We quote nominally:

Tin Plates, 10 x 14, 1st qual. Charcoal	22/ @ 23/
" " " " "	20/ @ 21/
" " " " Coke	18/ @ 19/
" " " " "	15/6 @ 16/

Spelter.—Is weaker and lower. We quote Ordinary, at shipping ports, £15 @ £15.5/.

Lead.—The market is quiet at unchanged prices. We quote Common English Pig, £13.5/ @ £13.10/.

Freights.—Steam from Glasgow to New York, 5/, and Liverpool to New York, 3/6 @ 5/6; Liverpool to Philadelphia, 9/; London to New York, 10/ @ 10/6.

FINANCIAL.

Office of THE IRON AGE.

WEDNESDAY EVENING, April 25, 1883.

The business outlook can hardly be said to have improved during the past week, notwithstanding the growing ease in the monetary situation. The general tone is sluggish and unsatisfactory and the season backward. It is true that money has resumed a condition of ease, with every prospect of ample supplies of loanable funds for months to come. This appears in the bank statement for the week, which is even more favorable than was anticipated, showing a restoration of the 25 % legal reserve. The reported surplus—the first since February 24—however, is only about \$600,000, against \$9,000,000 one year ago. The change noted is chiefly owing to the return of funds from the interior. Several prominent railway corporations have availed themselves of the opportunity to place on the market loans to a large amount.

In general trade business has failed to respond to the improvement in money. The bank clearing houses show a decreased volume of business, compared with last year, particularly in this city, and in Cincinnati, New Orleans and St. Louis the gains are slight. The movements of flour, grain and provisions toward the seaboard, as represented by the railroad shipments from Chicago, were smaller last week than for several preceding weeks. In the metal trade the event of the week was the announcement by the Thomas Iron Co. that it had decided to reduce its quotations for Nos. 1 and 2 Foundry Pig \$2 3/4 ton. The reported business failures of the week number 160, which is at least a third larger than the failures for a like period either in 1882 or 1881. Of the total, 24 were hardware firms or manufacturers.

Despite the rather somber hues gathered

from current reports, the spring trade is at last fairly under way, and with the resumption of navigation on the lakes and canals will receive a new impetus. The course of speculation in the grain market is in the direction of radically higher prices, and the same is true of provisions, pork having advanced in the Chicago market about \$1 3/4 bbl. within the past fortnight. The latest advices indicate diminished confidence, probably due to the more cheerful tenor of accounts from the wheat-growing regions—the coming crop promising to be at least equal to the average of recent years. Exporters have had the advantage of a lower freight market and a fairly steady scale of prices here, but orders from abroad are scarce or not on a working basis.

On the Stock Exchange during the week under review the market has been irregular and unsettled. In this respect the tone of speculation has radically changed, yielding more to a feeling of uncertainty. Depressing rumors and bear attacks early induced a feeling of weakness, and as the week closes a decline is noticeable through the entire list, Hannibal and St. Joseph alone excepted, which advanced on the announcement that the Chicago, Burlington and Quincy has bought a controlling interest in the property. On Thursday prices dropped 1/2 @ 3/4. On Friday there was a partial reaction, caused by the statement that the Northwesterns would soon place \$10,000,000 of new stock in the treasury, to represent roads recently acquired other than the Omaha. On Saturday a reduction in the price of Pig Iron aided in breaking down Lackawanna. Today stocks were dull and weak, but at the close were not materially changed. The most trading was in Union Pacific, at 97 3/4 @ 97 3/4; St. Paul, at 103 1/4 @ 103 1/4; Louisville and Nashville, at 53 1/4 @ 53 1/4; Lackawanna, 128 3/4 @ 128; Jersey Central, at 76 1/4 @ 76 1/4; Kansas and Texas, at 31 1/4 @ 30 3/4; Northern Pacific, at 50

\$21.50 @ \$22 from ship and yard; Summer-lee, \$24.50 from ship; Colness, \$24.50 @ \$24.75 from ship; Gartsherrie, \$25 from yard; Langlois, \$24.50 from ship.

Bar Iron.—The reduction in Pig Iron has stagnated business in Finished Iron. The demand has fallen off very materially, and consumers cannot be induced to place orders for future delivery. They are even buying very sparingly, and exercising every precaution within their reach before placing orders for immediate delivery. The decline in price on Crude Iron has not yet reached the Bar Iron trade, and probably will not, but so long as this uncertainty prevails the market will continue weak and the demand very light. Prices from the mills for Refined Iron range from \$2.10 to \$2.25, and for Common from \$1.90 to \$2.00. Manufacturers are manifesting considerable anxiety to sell at these figures, but not offering concessions. From store, Refined Iron is quoted at \$2.40 @ \$2.50, and Common at \$2.20 @ \$2.30.

Old Rails.—Like every other branch of the Iron trade, the Old Rail market may be called almost nominal. The supply appears to be larger than the demand, and, in the absence of transactions to report, we quote as before, nominally, \$23 @ \$24 for T's.

Steel Rails.—We hear of a good deal of inquiry and considerable sales at \$38 at mill for future delivery, somewhat higher prices being sometimes charged for immediate delivery.

Scrap Iron.—The market continues dull and prices unchanged. There is very little offering, and no inquiries on the part of furnacemen for stock on hand. We continue to quote No. 1 Wrought at \$26 @ \$27, ex-store at \$25.50, ex-ship at \$25, and Crop Ends at \$22 @ \$23.

METALS.

Copper.—Although inactive, our market has been firmer in the absence of a fresh supply from the Lake, 200,000 lb selling at 15 1/4¢ @ 16¢, Lake Superior, and 15¢ @ 15 1/4¢ other brands. German production was 20,000 tons last year, against 15,000 tons in 1881. In London Chili Bars have stood the last few days £62. 10/ @ £63, and Best Selected £70. We are cabled from there this afternoon as follows: "The market is a little weaker, and prices are lower. Best Selected, £68. 10/ @ £69; Chili Bars, £12. 10/ @ £13." Messrs. W. T. Sargent & Sons, London, write under date April 5: "In the early part of March there was a considerable demand for Chili Bars on speculation, producing, however, comparatively little effect on market rates, as sellers were abundant. Subsequently, when this demand had become satisfied, the market became very quiet, and prices gradually eased off, being now quoted about 40/ per ton lower than a month ago. This fall appears to be distinctly contrary to the real position of the article, for whereas we have, on the one hand, a good consumption, causing the reserves of available supply to fall from 60,760 tons on March 31st, 1880, to 43,238 tons on 31st ult., the present price is now actually lower than it was then. While, therefore, owing to the apathy of the trade, bears have made so far a good business by depreciating the market, so sound a position as undoubtedly exists in the Copper market is bound eventually to assert itself."

STOCKS AND QUANTITIES AFLOAT FOR ENGLAND AND FRANCE.

	1883.	1882.	1881.	1880.
Feb. 28, Mar. 31, Mar. 31, Mar. 31.				
Total tons...	42,969	43,238	47,497	56,357
Price of Chili Bars per ton...	£55	£54 15/	£54 5/	£61
Total tons...	60,760	53,744	47,362	
Price of Chili Bars per ton...	£56	£56	£53 10/	

No official change has yet been made in the combination prices of manufacturers. They remain: Bottoms, 31¢ @ 32¢; Braziers, 30¢ @ 36¢; Cables, 33¢ @ 36¢; Sheathing, 28¢, and Bolt Copper, 30¢; Segment Sheets, 33¢; Fire-Box do., 30¢. Considerable shading from these rates is said to be going on, but to what extent it is not easy to ascertain.

Tin.—The Billiton Sale at Batavia having gone at 66.66 guilders per picul—equal to £97. 10/ per ton cost and freight per steam to New York, or £98. 15/ laid down in London—there was rather a firmer feeling in this market, but it failed to lead to any great activity, London simultaneously wiring Straits, £96. 10/. The previous Billiton sale had averaged 64.54 guilders per picul. We quote Straits Tin to-day, large lines, 21 1/4¢ @ 21 1/2¢, on the spot, and L. & F. 22¢. This afternoon we are cabled from London: "The market has weakened a little. Straits Tin, 20¢ @ 20 1/2¢; L. & F. 21¢; Straits Tin, 20¢ @ 20 1/2¢; L. & F. 21¢." Messrs. W. T. Sargent & Sons, London, April 5, express themselves about Tin to the following effect: "More movement in prices is to be recorded for the month of March than in either of the two previous months. The spot value advanced, with occasional fluctuations, from £94 (the price on the 5th of March) to £98. 2/6 on March 10th. Since then it has again fallen to £94. 10/, and closes to-day at £94. 15/. It seems to be anticipated that, following the usual course of trade, we shall have smaller supplies over the next six months, and that stocks will steadily decrease. The American trade seems very sluggish, and although the consumption there is very good, dealers show no disposition at present to go into stock. This is a feeling which might suddenly alter when the New York money market gets settled and easy. The stringency there recently has been very unusual. In Cornwall, Tin mining affairs are very depressed, and our present range of prices is leaving disastrous losses to all the leading mines. Looking generally at the statistics, the two most noteworthy points are the increase in the Straits shipments on the one hand, and, on the other, the substantial decrease in the whole visible supplies, as compared with the years 1881 and 1880."

IMPORT INTO THE UNITED STATES.

(July 1 to March 1.)

	1883.	Value.
Re-export...	150,048	\$4,245,534
Or tons...	8,013	11,701
Net import...	160,263	\$4,287,273
Or tons...	8,013	11,701
Re-export...	100,142	\$2,701,402
Or tons...	21,640	\$55,801
Net import...	87,502	\$2,145,501
Or tons...	4,175	5,501

(July 1 to March 1.)

	1883.	Value.
Re-export...	2,844,418	\$11,608,687
Or tons...	7,314	31,976
Net import...	2,837,104	\$11,576,711
Or tons...	141,235	31,976
Re-export...	2,502,280	\$10,705,627
Or tons...	6,376	28,075
Net import...	2,505,994	\$10,677,552
Or tons...	129,293	28,075

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Net import...	2,505,994	\$10,677,552
Or tons...	129,293	28,075

(July 1 to March 1.)

	1883.	Value.
Re-export...	2,844,418	\$11,608,687
Or tons...	7,314	31,976
Net import...	2,837,104	\$11,576,711
Or tons...	141,235	31,976
Re-export...	2,502,280	\$10,705,627
Or tons...	6,376	28,075
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come in after July 1st, under the new tariff. As about one-half of the consumption of Bituminous Coal is by sea-going steamers, the effects of the tariff are said to be disastrous, even in anticipation, as consumers are expecting concessions on the part of producers to meet foreign competition, so that neither party are disposed to make engagements for the future.

The total Anthracite product last week was 446,181 tons, against 651,912 tons for the same week of last year, and the product for the year so far is 7,199,962 tons, an increase of 531,750 tons. The Eastern market is dull and otherwise unchanged.

FOREIGN TRADE MOVEMENTS.

The following is a summary of foreign trade movements during the past week:

For the week ended April 20:

	1883.	1882.	1881.
Total...	\$8,540,361	\$11,275,877	\$8,497,000
Prev. reported...	\$12,534,040	\$10,310,282	\$17,071,315

Since Jan. 1... \$130,175 3 1/4 @ \$160,585,159 @ \$145,568,317

Included in the imports were articles of merchandise valued as follows:

	Pkgs.	Value.
Brass goods...	89	\$1,072
Bronzes...	3	28
Clocks...	3	28
Copper...	210	210
Cutlery...	134	30,703
Gun...	26	5,883
Hardware...	16	600
Iron pipe, tons...	2,522	51,381
Iron sheet, tons...	32	2,727
Iron ore, tons...	1,599	4,075
Iron other, tons...	2,400	1,848
Railroad bars...	1,109	31,714
Railroad pigs...	1,039	4,804
Lead, pigs...	240	3,679
Machinery...	71	6,505
Manila...	159	21,347
Nails...	60	408
Needles...	11	417
Old metal...	1	5,620
Plate...	1,655	17,992
Plateware...	1	837
Quicksilver...	600	14,616
Saddlery...	6	1,370
Steel...	113,730	113,730
Spelter...	280	355
Silverware...	3	274
Tin, boxes...	63,845	320,859
Tin, bbls...	5	440
Tin, 110 lbs...	75,511	176,779
Wire...	100	17,606
Zinc...	108,893	4,530
Zinc oxide...	400	4,158

The quantity of various articles imported compares with previous dates as follows:

	For the 16 weeks.	Same week of 1882.	Same time 1881.
Cutlery, pkgs...	134	2,346	4,450
Hardware, pkgs...	16	375	372
Iron R. R. bars...	1,030	6,324	47,388
Lead, pigs...	240	1,312	9,505
Steel, pkgs...	82,028	864,779	624,593
Tin, bbls...	68,845	182,442	70,111
Tin slabs, lbs...	76,511	6,410,181	4,990,442

For the week ended April 21:

	1883.	1882.	1881.
Total...	\$1,866,070	\$1,866,070	\$1,866,070
Previously reported...	\$1,866,070	\$1,866,070	\$1,866,070

For the week ending April 24:

	1883.	1882.	1881.
Total...	\$1,866,070	\$1,866,070	\$1,866,070
Previously reported...	\$1,866,070	\$1,866,070	\$1,866,070

For the week ending April 24:

	1883.	1882.	1881.
Total...	\$1,866,070	\$1,866,070	\$1,866,070
Previously reported...	\$1,866,070	\$1,866,070	\$1,866,070

For the week ending April 24:

	1883.	1882.	1881.
Total...	\$1,866,070	\$1,866,070	\$1,866,070
Previously reported...	\$1,866,070	\$1,866,070	\$1,866,070

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	1883.	1882.	1881.
Total...	\$1,866,070	\$1,866,070	\$1,866,070
Previously reported...	\$1,866,070	\$1,866,070	\$1,866,070

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Total...	\$1,866,070	\$1,866,070	\$1,866,070
Previously reported...	\$1,866,070	\$1,866,070	\$1,866,070

For the week ending April 24:

	1883.	1882.	1881.
Total...	\$1,866,070	\$1,866,070	\$1,866,070
Previously reported...	\$1,866,070	\$1,866,070	\$1,866

Best Refined, 1/4 advance on the above.
Best Bloom Sheets, No. 22 to 25.....6 1/2¢
Best Bloom Sheets, No. 16 to 21.....6 1/2¢
Common Red Plates, 3-16 to 10.....3 1/2¢
Blue Annealed, 3-16 to 10.....3 1/2¢
Best Bloom, Galvanized, discount.....40¢
Second quality, discount.....50¢

Wrought Iron Pipe.—Demand is again reported quiet, and business is said to be in a very unsatisfactory state, prices being weak and unsteady. There is some little business doing, but orders are principally for small lots. Large orders appear to be few and far between. We quote 55¢ @ 57 1/2¢ off list price on Boiler Tubes, and 70¢ off on Gas and Steam Pipe. These figures would probably be further shaded, according to size and specification of order.

Steel Rails.—There is nothing of interest to report in this department. Prices are steady, but sales have not been of much importance. Summer deliveries are in fair demand at about \$39, and for the next six months Pennsylvania mills have their capacity tolerably well under contract. There is a good deal of caution among buyers, however, and unless likely to require material within the summer months, there is very little disposition to enter into contracts. For winter delivery prices could be shaded, but, in the absence of sales, quotations would be entirely nominal and of little value. Light Rails are in fair demand and have sold at \$40 @ \$43 at mill, according to pattern, and Street Rails at \$46, New York.

Crop Ends.—There have been no sales during the week, because of the advanced views of holders. From \$22.75 to \$23.25 might possibly be accepted, but firm offers are difficult to get even at outside quotation. Stocks light and in strong hands.

Old Rails.—No transactions within the past week, although T's are offered for May and June delivery at \$23.50, and Double Heads at \$27.50. Market dull, with somewhat of a declining tendency.

Scrap Iron.—The market is extremely dull and sales in quantity hard to make. Prices may be quoted \$24.50 @ \$25 for foreign, and \$25.50 @ 26 for selected yard lots.

Nails.—There has been a fair movement in the Nail market, and a brisk demand is not altogether unlooked for during the next few weeks. Stocks are generally reported light, but, owing to close competition for orders, prices have not improved; \$3.15 is the general asking price.

PITTSBURGH.

(By Telegraph to The Iron Age.)

Office of The Iron Age, 77 Fourth Avenue, Pittsburgh, April 25, 1883.

The Nail Association, at its meeting to-day, took no action regarding prices. Reports show that within the past two weeks the demand for Nails in the West has increased very greatly. There seem to be no stocks in hands of consumers, jobbers or mills. The outlook for trade for the balance of the season is very good—indeed, the miners at their meeting yesterday decided to strike on May 1, unless they receive 3 1/2¢ a tushel for digging.

Office of The Iron Age, 77 Fourth Avenue, Pittsburgh, Pa., April 24, 1883.

The Iron situation has not improved during the past week, and the outlook is not encouraging. While the Marshall collapse, since it has become better understood, has not produced as much mischief as was expected, it has had a depressing influence, nevertheless. One effect will be to tighten the money market, as the banks will draw the lines much more closely, and individuals or firms considered in the least doubtful will have more difficulty for the time in obtaining accommodations. Most of the older Pittsburgh firms, however, instead of waiting to borrow, are able to discount their own paper, and no additional financial troubles are looked for. The failure of Marshall & Co. was not caused by their regular, legitimate business, but in consequence of speculation in Pig Iron, which, at first profitable, proved in the end disastrous. The liabilities foot up close upon \$2,000,000, or about \$300,000 in excess of the assets. An attempt will be made to hold the Marshall estate as a partner in the foundry, and, if successful, it is believed the unsecured creditors will stand a good show of getting their money in full. Suit has already been commenced by one of the unsecured creditors against the estate, and it will probably be made a test case. The 60,000 tons of Pig Iron that had been bought up by the now defunct firm is mostly in the hands of banks as collateral, and there is no probability that any attempt will be made to force it on the market, as the bank managers know very well it would be disastrous, in the present condition of affairs, to do so. No doubt this Iron will be placed in such a shape that it can be sold, the same as any other Iron, when it can be done advantageously to those concerned.

Pittsburgh has suffered a great loss in the death of James Park, Jr. as a Steel manufacturer, being the senior member of the firm of Park, Bro. & Co., of the Black Diamond Steel Works. Mr. Park had a national reputation, and he was well-known by Steel manufacturers across the ocean. No man did as much, perhaps, for the development of the American Steel interest as Mr. Park, he having given it his entire time and attention for a number of years, and his death will be a serious loss to that important industry. In addition, he was strongly in favor of protection to American industry, and spent the greater part of the past winter in Washington working for protection.

Ores.—Continue considerably demoralized, in sympathy with Pig Iron, and prices are weak and irregular. Republic Ore, the price for which was fixed recently at \$8.50, we are reliably informed can now be had at \$8, and other Lake Ores, it is claimed, at \$7.50. The furnaces for once have the upper hand of the Ore companies, having secured the same by holding off and refusing to contract beyond their immediate wants, and the indications are that this policy on the part of the former will be adhered to during the remainder of the year. Some few contracts have been made for Bessemer Ores by furnaces having contracts for Bessemer Iron. The next thing in order will be

for the railroads to reduce the cost of transportation; the Ore and Pig Iron companies are coming down to hard-pan, and the railroads, however disagreeable it may be to them, will have to follow suit. All Lake Ores are from \$2 to \$2.50 per ton lower than at the corresponding time last year, and it would be nothing more than right for the railroads to stand a portion of this reduction by affording the Ore companies a lower rate of freight.

Pig Iron.—The dullness noted for some time past continues, and there is not much prospect of any immediate improvement in the demand. While, as stated elsewhere, it is not likely that the 60,000 tons of Marshall Iron will be forced on sale, the fact that all this Iron will be placed on the market just as soon as it can be disposed of is not without its effect, and consumers, as in the past, will continue for the present to buy only as their immediate wants require. It is worthy of mention that the banks holding the Iron to which reference has been made will not sacrifice it; some of them cannot afford to sell much below present prices without losing money, and it is not likely that they will do anything to break the market. As compared with a week ago, prices remain unchanged, as follows:

No. 1 Foundry.....\$21.50 @ 22.50, 4 mos.
No. 2.....20.00 @ 21.00, 4 "
Neutral Gray Forge.....18.50 @ 19.50, 4 "
Bessemer Iron.....22.00 @ 22.50, 4 "
Cold-Blast Charcoal.....30.00 @ 35.00, 4 "

There were a couple of sales of Extra Forge Iron reported at \$20, 4 mos., but there is no trouble in buying good brands of Neutral at our outside quotations, \$19.50, 4 mos. A round lot of Bessemer Iron was sold at \$22, 4 mos.; also some small lots at \$22.50.

Muck Bar.—We can report a sale at \$35, 4 mos.; may be quoted at \$34 @ \$35, cash and time, according to quality, with a very light demand.

Manufactured Iron.—There has been but little change in the general position of the market during the past week, with the exception that large buyers who have been holding off in anticipation of lower prices are now more disposed to buy, in apprehension of a strike, and the mills for the same reason are refusing to book orders for delivery beyond next month. The latter intend to keep themselves in such a condition that, in the event of a shut-down, they will have but few, if any, orders on their books. Prices are still quoted on a basis of 1.00¢ @ 2¢, 60 days, for assorted orders, with usual discount of 2% for cash. Some sales have been made at 2¢, delivered at Chicago, equal to about 1.85¢ here.

Nails.—There is a very fair demand; while large orders are not numerous, small ones are reported plentiful, and manufacturers say that they have all they can do. Stocks are light both in first and second hands, and the indications are that the present activity will hold for some time to come. Prices remain as last quoted, \$3.10 @ \$3.15, 60 days, in a jobbing way, and \$3 for car-load lots and upward, with the usual discount of 2% for cash.

Wrought-Iron Pipe.—There is a fair degree of activity, but prices continue very unsatisfactory, and are certainly down as low as they can go. Sales of Gas and Steam Pipe have been made as low as 75¢ off regular list for desirable orders, but this is an extreme quotation; Boiler Tubes quoted at 57 1/2 @ 60¢ off.

Steel Rails.—Heavy Sections are still quoted at \$39 @ \$40 for near-by delivery; the last sale reported was at \$39.50. The mills here are very well supplied with orders, and the market is steady at the prices quoted.

Old Rails.—The market for American T's has weakened materially during the past week, and prices are off fully \$1 per ton; we hear of offers to sell at \$25, without finding buyers, who, it is evident, expect a still further decline. We hear of a round lot having been offered at a point West at a price equal to but little, if any, better than \$24 delivered in Pittsburgh. Nothing doing here in Double Heads.

Railway Track Supplies.—There is nothing new to note; business only fair; prices weak, but unchanged. Railway Spikes, 2.60¢, 30 days; Splice Bars, 2¢; Track Bolts, 3.25¢ with Square and 3.35¢ @ 3.40¢ with Hexagon Nuts.

Steel.—The general Merchant Steel trade continues dull and unsatisfactory, and while card rates remain unchanged, prices are being cut considerably as regards the lower grades.

Crop Ends.—There have been no sales reported for a couple of weeks, in the absence of which we quote at \$25 @ \$25.50, cash, per gross ton. Bloom Ends, last sale reported, was equal to \$25, cash.

Scrap.—No. 1 Wrought Scrap is quoted nominally at \$24 @ \$25 per ton for Ordinary, and \$26 @ \$27 for Selected Railway; Wrought Turnings, \$16 @ \$18; Old Car Axles, \$33 @ \$35; Old Car Wheels, \$21.50 @ \$22, gross; Cast Borings, \$12.50 @ \$13.50.

Coke.—A further reduction of 10¢ per ton in the cost of transportation of Coke by the Pennsylvania Railroad to Chicago, which makes in all a reduction of 27¢ per ton, a decline of 17¢ having been made a few weeks ago. The price of Coke at the ovens remains unchanged at \$1.05 per ton, and business is all that can be expected in view of the depressed condition of the Pig-Iron trade.

CHICAGO.

Office of The Iron Age,
36 and 38 Clark St., cor. Lake,
Chicago, April 23, 1883.

Nails.—We note change in price of Nails (rod. to 60d.) in carload lots, which are now quoted at \$3.25, and \$3.35 for smaller lots, with the usual discount off for cash.

Manufactured Iron.—There are no changes to note in the market for Merchant Iron, the demand for which is good, and quotations continue unchanged, as follows: Bar Iron, 2.30¢ @ 2.40¢ rates; Angle Iron, 3.10¢ @ 3.30¢ rates; T Iron, 4¢ rates; Beams, 3.80¢; Channels, 3¢; Tank Iron, 3¢ @ 3.20¢ rates; Sheet Iron, 3.20¢ @ 3.40¢ rates; Norway Original Bars, 4 1/2¢ rates; Norway Re-rolled Bars, 5 1/2¢ rates; Ulster, 4 1/2¢ rates; Low Moor Iron, 8¢ rates; Nuts and Washers, 8¢ off list; Wrought Boat Spikes, 3 1/4¢ rates.

Pig Iron.—A little more firmness is to be noted in the quotations on Lake Superior Charcoal Iron, although we have as yet no change to note. The market for Southern Coke Irons has a downward tendency. No. 1 is now quoted at \$23.85, and No. 2, \$22.55, 4 mos. The demand for Scotch Imported is light and the supply small. We quote, per ton, \$31, while the volume of business done in Pig Iron generally during the past week has been light. We quote: Lake Superior Charcoal, for Nos. 1 and 2, \$24; No. 3, \$25, and Nos. 4, 5 and 6, \$25, 4 mos.; Briar Hill, \$25; Silvery Soft, \$23 @ \$24; Crane No. 1, \$27.50; No. 2, \$26.50; Himrod, \$24; Thomas, \$24 @ \$26; American Scotch, \$24 @ \$25; Du Val, No. 1, \$24; No. 2, \$23; Fulton Notch, No. 2, \$22.50; No. 3, \$21.50; Calumet, \$23 @ \$23.50, 4 mos.

Steel.—Quotations still continue somewhat irregular, while the demand is fair. We quote as follows: Tool, 12¢; Machinery O. H., 5¢; Crucible Machinery, 7¢; Hammer, 2 inches and under, 8¢; over 2 inches, 9¢; Cast Spring, 6¢, and O. H. Spring, Tire and Sleigh Shoe, 5¢; Sheet, first, second and third quality, 12¢, 10 1/2¢ and 8 1/2¢ respectively; Crucible Plow, 6¢; Eagle Plow, 5¢; Iron Center Plow, 9 1/4¢, and Soft Steel Center Plow, 9 1/4¢; Cast Plow, 5¢; German Plow, 4 1/2¢.

Scrap Iron.—We have no quotable change to note, while the demand continues to be dull. The following are the purchasing prices paid by dealers: No. 1 Railroad Wrought Scrap, per net ton, \$21; No. 1 Country Wrought Scrap, per net ton, \$19; No. 1 Cast Scrap, per ton, \$17; No. 1 Stove Plate Scrap, per ton, \$11; Machine Shop Wrought Turnings, per ton, \$10; Cast Iron Borings, \$7; Old Plows and Plow Steel, \$13.

CHATTANOOGA.

Office of The Iron Age, Market and 8th Sts.,
CHATTANOOGA, April 23, 1883.

Business is fair. Crops are growing finely. Rains are abundant. The days are warm and the nights cool. Everybody is encouraged over the fruit and general crop indications throughout the section. Sugar planters report the best outlook for many years. Prices of most manufactured articles are weak. There is a general disposition to buy just as much, and no more, of any material as will meet immediate wants. All consumers count on lower rates. The weather for the week has been warm and showery.

Pig Iron.—The movement of metal is not quite as lifeless as last week, though little is doing in large bills. Stocks are not accumulating to any great extent. Furnace-men are generally cheerful and able to go on at present or even lower quotations. No. 1 Foundry is scarce. We quote: No. 1 Foundry, \$22 @ \$23; No. 2 Foundry, \$20 @ \$21; Gray Forge, \$18 @ \$19; White and Mottled, \$16 @ \$18; Car-wheel Metal, \$28 @ \$30.

Ores.—We quote: 50% Brown Hematite, per ton, \$2 @ \$2.75; Red Fossil, \$2 @ \$2.25, delivered at furnace.

Miscellaneous Articles.—Old Rails are dull at about \$23; Wrought Scrap, \$18 @ \$22; Cast Scrap, \$11 @ \$14; Old Wheels, nominal, \$22.

Nails.—The market is not lively. We quote them at \$3.25 rates—15¢ higher for carpenters' supplies. Wheeling is filling up Memphis and all the towns below that on the Mississippi at about \$3 @ \$3.10, laid down.

Manufactured Iron.—But for hope of a speedy improvement, and desire to keep the men at work, several Southern mills would suspend and wait for a better market to come from short supplies. We quote Bar at \$2.20; Railroad Spikes, \$3; Track Bolts, \$3.50; Fish Plate, \$2.50.

Coke.—We quote: Fancy Lump, \$3.50; Common, \$3; run of mine to manufacturers, \$2.

Coke.—We quote: Furnace Coke, \$3 at point of consumption; Foundry, 10¢ @ 12¢ per bushel.

CINCINNATI.

APRIL 23, 1883.—**Pig Iron.**—Some increase in the volume of trade in the past week at about former quotations. Transactions are confined almost entirely to the immediate wants in both foundries and rolling mills. Stocks of No. 1 Hanging Rock Charcoal and Coke Foundry are not in excess of needs. Of the former there will be barely enough to bridge over until furnaces resume work in May and June. No. 1 Hanging Rock Charcoal Foundry, \$25; No. 1 Coke, \$22.50 @ \$23; No. 2, \$1 less. Southern Charcoal and Coke Irons are reported as in excess of demand, and owners are fully meeting the views of consumers as to prices, which may be quoted at from \$21.50 to \$22.50 for Charcoal, and from \$20 to \$21.50 for Coke. Forge Irons, from \$17.50 to \$19 for Coke, and \$20 @ \$21 for Charcoal Hanging Rock; American Scotch, \$21.50 @ \$22; Silver-Gray Softeners, \$20 @ \$22.

LOUISVILLE.

GEO. H. HULL & Co., Commission Merchants, report to us as follows, under date of April 21, 1883: Of Car-wheel Iron there is more selling, but sales are at very low prices. We quote for cash, in round lots, as below:

FOUNDRY IRON.
No. 1 Hanging Rock Charcoal.....\$25.00 @ 26.00
No. 1 Hanging Rock Stonecoal and Coke.....22.00 @ 23.50
No. 1 Southern Stonecoal and Coke.....22.00 @ 22.50
No. 2 Southern Stonecoal and Coke.....20.50 @ 21.00
American Scotch.....20.50 @ 21.00
Open Silver-gray.....19.50 @ 20.00
Close Silver-gray.....19.00 @ 19.50

MILL IRONS.
No. 1 Charcoal.....20.00 @ 21.00
No. 1 Stonecoal and Coke, Neutral.....19.50 @ 20.00
No. 2 Stonecoal and Coke, Neutral.....18.50 @ 19.00
No. 1 Stonecoal and Coke, Cold-short.....18.00 @ 18.50
No. 2 Stonecoal and Coke, Cold-short.....17.50 @ 18.00
White and Mottled, Cold-short and Neutral..........

CAR WHEEL IRONS.
Hanging Rock, Cold-blast.....39.00 @ 35.00
Hanging Rock, Warm-blast.....35.00 @ 27.00
Alabama and Georgia, Warm and Cold-blast.....36.00 @ 28.00
Central Kentucky, Cold-blast.....26.00 @ 28.00

W. B. BELKNAP & Co., Iron and Steel Merchants, Nos. 115 to 121 West Main street, report to us as follows, under date of April 21, 1883: There is a fair amount of business

doing in Bar Iron, but not demand enough to affect prices favorably. Mills claim to be well sold up for several weeks ahead, and we can hear of none forcing their product on the market. Many have withdrawn their quotations on Sheet altogether, and that class of Iron is firm. Quotations about as follows: Bars, 2.15¢ @ 2.25¢; Light Steel, say, 3.90¢ @ 4¢ for 26 and 27, respectively, in large wholesale lots from mill or store. Hoops are still dull. Nails are active, arriving in moderate quantities, and selling freely on arrival. There is apparently a halt in the downward tendency, and the principal cutting is by those jobbers who have no confidence in the maintenance of the present price by the manufacturers. General trade is improving under the stimulus of genuine spring weather, warm rain and generous sunshine. Building operations are active in this city, incident to preparation for the Southern Exposition in August, and also to a large demand for cheap dwellings for workmen and others of moderate means.

ST. LOUIS.

HOPFER & Co., Pig Iron and Iron Ore Merchants, 417 Pine street, report to us as follows, under date of April 21, 1883: Prices have declined some since our last report, and but little doing. Quotations are:

HOT-BLAST CHARCOAL IRONS.

Missouri.....\$21.00 @ 22.00
Southern.....22.00 @ 23.00
Ohio.....27.00 @ 29.00

COAL AND COKE IRONS.

Missouri.....\$21.00 @ 22.00
Southern.....20.00 @ 21.00
Ohio.....21.00 @ 22.00

MILL IRONS.

Red Short.....\$19.00 @ 20.00
Neutral.....18.00 @ 19.00

CAR WHEEL AND MALLEABLE IRONS.

Missouri.....\$21.00 @ 22.00
Southern.....25.00 @ 26.00
Ohio.....25.00 @ 26.00

RICHMOND.

ASA SNYDER, Iron Merchant and Furnace Agent, writes as follows, under date of April 23, 1883: The Iron trade is quiet, both for manufactured and raw material. Quotations as follows:

No. 1 Scotch Pig Iron.....\$24.00 @ 25.00
No. 1 Anthracite Pig Iron.....24.00 @ 26.00
No. 2.....23.00 @ 24.00
No. 1 Virginia Coke Pig Iron.....23.00 @ 23.50
No. 2.....21.00 @ 22.00
No. 3.....19.00 @ 21.00
White and Mottled.....18.00 @ 20.00
Virginia C. B. Charcoal.....27.00 @ 29.00
Old Dom. Nails (carload lots).....3.00 @ 3.40
Old Rails.....3.00 @ 3.40
Old Wheels.....19.00 @ 22.00
Wrought Scrap, No. 1.....21.00 @ 22.00
Cast Scrap, No. 1.....18.00 @ 19.00
Richmond Refined Bar Iron.....2.40 @ 2.60
Horse Shoes (Tredegar).....4.50 @ 5.00
Mule.....5.50 @ 6.00

BALTIMORE.

W. N. WYETH, Iron and Steel Merchant, 46 and 48 South Charles street, reports us the following, under date of April 23, 1883: Trade for the past week has ruled unusually quiet and disappointing for this section. Values are seemingly weakening, and daily shaded as an incentive to induce business; hence many transactions are made on a basis of cost or shading same.

Ref. Bar Iron, 1 to 6 x 3/4 to 1, 1/2 lb. 2 1/2 @ 2.35¢
" 1 to 4 x 1 1/4 to 1, 1/2 lb. 2 1/2 @ 2.35¢
" 1/2 to 3, Round.....2 1/2 @ 2.35¢
" Square.....2 1/2 @ 2.35¢
Hoop Iron, 1/2 wide and upward.....3 1/2 @ 3.20¢
Band Iron, from 1/2 to 6 in. wide.....2 7/8 @ 2.80¢
Horse-shoe Iron.....3 1/2 @ 3.5¢
Norway Nail Rods.....3 1/2 @ 3.5¢
Black Diamond Cast Steel.....11 @ 12 ¢
Machinery Steel.....4 1/2 @ 5 ¢
Spring Steel.....10 @ 11 ¢
Common Horse Nails.....4 @ 4 1/2 ¢
Railroad Spikes, 3/4 x 9-16.....2 1/2 @ 2.75¢
Perkins' Horse shoes, 1/2 keg of 100.....4.17 1/2 ¢
Mule shoes.....5.37 1/2 ¢

R. C. HOFFMAN & Co., Pig and Railroad Iron Merchants, No. 21 South Frederick Street, report us as follows, under date of April 21: We have no change to report in the Pig Iron market, inactivity being still the prevailing feature, with sales confined to immediate requirements. We quote:

Baltimore Charcoal Wheel Iron (all Baltimore Ore).....\$28.00 @ 29.00
Virginia C. B. Char. Wheel Iron.....28.00 @ 29.00
Anthracite No. 1.....23.00 @ 24.00
No. 2.....20.00 @ 22.00
No. 3.....16.00 @ 18.00
White and Mottled.....16.00 @ 18.00
Charcoal C. B. Blooms.....50.00 @ 55.00
Refined Blooms.....45.00 @ 47.00

SAN FRANCISCO.

J. W. HARRISON, Coal and Metal Broker, 204 California street, reports as follows, under date of April 14, 1883: **Pig Iron.**—Pig Iron does not show the decline since the favorable change in our crops that Coal has done. This is attributable to our sources of supply being Glasgow and Ardrossan, and but few disengaged vessels happen to be there. Lower prices may be anticipated.

To arrive. Spot.
Glenarneck.....\$25.00 @ 26.00 per ton.
West Hartley.....7.25 @ 7.50 "
Shotts No. 1.....28.75 "
Clay Lane, White.....25.00 "
American No. 1.....31.00 "

Coal.—Since last week's review there has been a further decline of 25¢ per ton average on all Bituminous Coals. This was expected if our weather continued favorable. Australian Coal is more freely offered than any other grade, as vessels on that side show a disposition to come here seeking outward grain charters—they willingly accepting a very nominal freight on Coal, last quotation being 13¢ per ton. Anthracite grades and Cumberland are in full supply, but are held at last week's quotations:

To arrive. Spot.
Australian.....\$6.50 @ 6.75 per ton.
Liverpool steam.....7.00 @ 7.25 "
West Hartley.....7.25 @ 7.50 "
Scotch Splint.....7.00 @ 7.25 "
Cardiff.....7.25 @ 7.50 "
Lehigh Lump.....13.00 @ 13.25 "
Cumberland, bulk, 11.00 @ 11.25 "
Egg, Hard.....12.00 @ 12.25 "

FOREIGN.

(Moniteur des Interets Matériels.)
PARIS, April 6, 1883.—**Metals.**—Business has commenced to pick up again, but metals are sustained with some difficulty. Copper and Tin are lower. We quote at the close, the former: Child Bars, 167.50 @ 171.25; Ingots and Slabs, 175; Best Selected, 177.50; and Pure Corroscoro Ore, 170.75;

Tin, Banca, 264.50; Billiton, 257.50, and Straits, Australian and English, 255. In a good many respects the situation in France is not what it should be at this time of the year. Work begins to get scarce in a good many localities; in this city, in consequence of the coal estate companies' troubles, an acute crisis is even at hand. It is at present difficult to get 10 francs for Merchant Iron in this city, nor would Flooring Iron bring more. The import during the first two months of the year has been 44,270 tons of 1 1/2 lb. Iron, against 41,475 in 1882; Finished do., 18,551, against 21,082, and Steel, 10,159 against 504. The import of Iron Ore was 230,054 tons, against 212,259 in 1882, and 150,806 in 1881. The Montataire Rolling Mill Co. intend erecting at Paray, in the Pas-de-Calais, a great Steel works; this company are, at the same time, the owners of the Outreau blast furnaces, where an excellent Pig Iron is turned out. The cost of this Steel works is to be 20,000,000 francs. At Marseilles, Iron and Steel prices are firm; they quote French Steel 35.50 francs per 100 kg.; Swedish, 31; Merchant Iron, 21; Scotch Pig, No. 1, 11 francs; Paris Wire Nails, No. 15, 3.25; Spanish Copper, 157.50; Tokat, 167.50; Ingots, 185; Sheathing, 200; Bolts, 210; Yellow Metal Sheathing, 105; Tin, 30; Spot, 267.50; Lead, 31 @ 32; Pipe and Sheet, 30; Spot, 37.50; Antimony, 125; Vieille Montagne Sheet, Zinc, 55; Spelter, 37.50. Coal.—Coal cannot be called very active, yet prices are upheld.

BELGIUM.

(Moniteur Industriel.)

BRUSSELS, April 10, 1883.—**Iron.**—Business still develops slowly, so that makers in general in Belgium cannot be called contented. Just now the demand remains slack, causing dealers to be restricted, however great efforts may be to infuse life into trade. Meanwhile Pig Iron is as stiff as it has been for some time past, nor is there likely to be anything like a decline in it unless something unforeseen should occur in the general aspect of the Iron market not now discernible. It is to be hoped that the demand for Finished Iron may soon manifest itself with some vigor; the activity of our rolling mills is at present a purely hand-to-mouth one, keeping them moderately busy, so as not to be compelled to discharge hands, but being out of proportion small compared with the capacity of works. Prices have in the meantime retained their steadiness. English Pig Iron commands 5.80 francs per 100 kg.; Charleroi do., 7.25; Luxembourg keeps up the price of 6.25 in spite of English competition. Athus-Hainin's holds his Pig Iron at 5.75, and other Belgian Pig sells at 5.25 @ 6.2. Merchant is barely worth 11 No. 1; 14 No. 2, and 15 No. 3. Beams are better held at 14; Corners do not easily bring 14.50. Sheets No. 2 we may quote 18 francs; No. 3, 20, and No. 4, 28. Commercial, 22, and Tins, 24. At a recent adjudication of Galvanized Iron Wire for the Government telegraph lines the Germans have been thoroughly beaten by the Angleur Works, who tendered Steel Wire 15% cheaper. Metals are barely sustained at existing quotations: Copper, 173 francs per 100 kg.; Tin, 255 @ 257; Soft Lead, 32.50, and in the coal.—Our market has maintained the same firm attitude heretofore described without change in figures.

GERMANY.

(Borsenhalles.)

HAMBURG, April 11, 1883.—**Iron.**—The demand for both Pig and Merchant has been active in the Iron regions of Germany during the week, extending to pretty much all sorts of large sales have been made of railroad material in particular. This may also be said of Foundry, Puddling and Bessemer Pig. Orders have been received for Bar Iron, deliverable in lots to a good each other rapidly. All sorts of small Iron are in request. Sheet Iron in general and thin sheets in particular remain wanted; in the latter orders are looked forward to from the United States. Steel works have been busy, notwithstanding the fact that there are at present not so many orders as material adjudications as usual. In Westphalia the owners of blast furnaces do not think of making the least concessions, as had been supposed would be the case a few weeks ago. On the contrary, they intend making rolling mills pay a little more for what they may require. The only thing dull and neglected is Spiegel.

GERMAN PRODUCTIONS.

	1882.	1883.
Pig Iron.....	3,225,000	2,858,000
Spelter.....	109,000	104,000
Copper.....	92,000	87,000
Coal.....	30,000,000	48,777,000
Lignite.....	13,238,000	12,516,000
Total.....	46,880,000	64,657,000

At a recent Steel Rail adjudication

is no denying. One hears the same complaint on all sides and from "all sorts and conditions of men." Here in London the grumbling is a very conspicuous item of business conversation—indeed, to believe all one hears would be to form the conclusion that the commerce and trade of Great Britain had suddenly collapsed. We know, as a matter of fact, that that idea would be false and misleading. The constantly growing competition in almost all lines of business naturally produces a proportionate slackness among the older houses, for every new firm must prey upon its competitors to some extent. The older houses feel this without exactly knowing what is the matter, and their complaints lead to the impression just indicated. Our official statistics and other returns show beyond all doubt that the volume of trade is almost always increasing, so that, if the experience of individual firms be unfavorable, the aggregate turnover does not diminish. I should imagine that this is the true explanation of the present state of things, inasmuch as the Board of Trade returns for March demonstrate but a fractional decrease of exports during that month.

As regards the British iron and steel trades, I have extremely little news to communicate. Since I last wrote, there have been scarcely any alterations in respect either of prices or other conditions, save a further declension in the value of Glasgow warrants and a more pronounced weakness in Cleveland pig iron. In manufactured iron there is a very limited turnover, both producers and consumers preferring to wait the results of this week's quarterly meetings before concluding negotiations now in hand. There is no sound reason for assuming that the Staffordshire "list" houses will make any change whatever in marked bars, but the lower grades of merchant iron may possibly give way a little; hence buyers think it only prudent to await the outcome of the meetings. It is rumored that rather large orders are being held back by London and Liverpool merchants, but as the meetings are now close at hand, I will not waste your space in attempting baseless vaticinations. In iron rails there is nothing doing, and only a very limited call for old rails. These latter are mostly in the hands of railway companies who are strong enough to hold out for higher prices. Heavy wrought scrap is called 57 6/6 @ 60 1/2 ton, o.b. London, &c. In Bessemer blooms I hear of no new export business. Crop ends are quoted 60 1/2 ton, f.o.b. Wales, &c., with buyers over, as the crops are rather scarce. In old railway leaf-spring steel the Messrs. Austin report "nothing doing." Steel rails have "gone off color" again somewhat, under the influence of a poor demand and few sales of moment. For 56 to 58 lb sections, &c., £5 @ £5 5/2 ton is quoted, but I think that large buyers could shade these figures by 5/ or so 1/2 ton.

are irregular, with only a moderate amount offering for United States ports. For pig iron, Glasgow to New York, by ordinary steamer, 4/ @ 5/ rules, and Liverpool to New York is nominal at about 3/ @ 5/. Liverpool to Philadelphia is 7/ @ 7 1/2 for pig iron. From Middlesboro' steam rates for iron or steel are: New York, 7/ @ 7 1/2; Philadelphia, 8/ @ 9/; Baltimore, 8/ @ 9/; Boston, 9/; Montreal, 10/ @ 10 1/2; New Orleans, 13/ @ 14/. From Wales by steamer: New York, 8/ @ 9/; Philadelphia, 9/ @ 9 1/2; Baltimore, 9/ @ 9 1/2; Boston, 9/; and New Orleans, 15/. From Wales by rail: New York, 6/ @ 6 1/2; Philadelphia, 7/; Baltimore, 7/; Boston, 7/; Montreal, 8/6, and San Francisco, 13/ @ 14/ 1/2 ton. From these places steam tonnage is fairly plentiful. As to the Bristol channel ports, Messrs. Edwards, Robertson & Co., Cardiff, write me: "Very little increase is shown in the exports to the States for the past month. There is, however, at present a stronger inquiry for forward shipment in rails, crops, &c., which leads us to infer that better business may be looked for at no distant date. There is no tendency to higher rates in the freight market at the moment, ample room being offered by the regular liners at the nominal figures now current. We are of opinion, however, that this will not last long, because, in the event of outside tonnage being asked for, we shall undoubtedly see higher figures ruling, as there is no inducement whatever in the shape of remunerative employment homeward for that class of tonnage. Engagements are being made to Baltimore at 8/6, and to New York at 8/ @ 8 1/2. Montreal has made considerable engagements for the ensuing season. We understand 15/ is about the figure paid."

With regard to Australian, &c., rates, in which many American manufacturers are interested, Mr. W. Balchin, of London, reports: "Since my last, outward rates of freight to the Colonies have continued weak, and to one port a small reduction has been made. Brokers, however, have had some difficulty in filling up the different berths, the long prevalence of easterly winds keeping ships out of port. By steam, however, to Australia, the reverse is the case, 'supply far exceeding demand,' and this will not be improved by the advent of a new line, which will be advertised in a few days, in opposition to the existing brokers' combination. Shippers, likewise, prefer the slow delivery by sailing ships to steam, thereby giving the present glutted markets time to recover. Rates of freight may therefore be expected to be much lower than they have been for some time past. The outward Cape freights are still in favor of the shipper, very little improvement being manifest. For India and China freights are a little firmer, trade generally showing a slight improvement. To America a trifling advance in outward rates is manifest, the settlement of the United States tariff giving an impetus to trade."

London to United States rates are nominal, but scrap iron or old rails might be done, probably, at 7/ @ 9/ 1/2 ton by sailors to New York, Philadelphia or Baltimore.

AN EXPLANATION.

Some time ago I informed you that Mr. Thomas Jessop, the well-known and highly respected head of William Jessop & Sons, Limited, would leave Sheffield in April to pay a farewell visit to the States. That statement I made on what I took to be reliable information. I was wrong, nevertheless. Mr. Thomas Jessop feels himself too old to

again cross the Atlantic, although he would much like to do so. His son, Mr. William Jessop, with Mrs. Jessop, Miss Jessop and Miss Unwin, sailed for New York from Liverpool on Saturday, April 9. On April 28, Mr. A. A. Jovitt (Thomas Jovitt & Sons), with his two daughters and Mr. Henry Harrison (Harrison Bros. & Howson), will also leave for the United States. All the gentlemen named are particularly well known to many of the readers of *The Iron Age*.

MIDDLESBORO' PIG IRON

is excessively quiet, with a poor turnover, despite the fact that No. 3 foundry is offered as low as 40/ 1/2 ton. Shipments are only of a moderate character and the local demand is quiet, coupled with which there is literally no speculation whatever. G. M. B., f. o. b. at makers' wharves in the Tees, are quoted, net cash (less 2 1/2 % 10th of following month), as under:

No. 1 Foundry.....	44/6	Mottled.....	39/6
" 2 "	42/6	White.....	38/6
" 3 "	40/ @ 42/6	Refined Metal.....	56/6
" 4 "	40/6	Kentledge.....	41/6
" 4 Forge.....	39/6	Cinder.....	35/6

In the manufactured iron trade it has been agreed that the men's wages shall remain as at present during 1883, and that the make shall be restricted to 10 shifts per 14 days. This applies to plates, angles, bulbs, tees and channel iron.

CLEVELAND IRONMASTERS' RETURNS.

Subjoined are full official details of the make and disposal of Cleveland pig iron during the month of March:

MAKE OF PIG IRON.

	1883.	1882.	Increase.	Decrease.
Tons.	Tons.	Tons.	Tons.	Tons.
Cleveland pig, port of Middlesbrough	123,246	115,954	12,292	.....
Cleveland pig, outside	20,883	27,013	1,070	.....
Cleveland pig, whole district	158,129	143,867	14,262	.....
Other kinds, including hematite, spiegel and basic pig iron, whole district	78,866	68,623	10,243	.....
Total of all kinds, whole district	236,995	212,490	24,505	.....
Furnaces on Cleveland pig iron at end of month, whole district	85	86	.....	.....
Furnaces on hematite, &c., at end of month, whole district	35	33	.....	.....
Total	120	119	.....	.....

STOCKS OF PIG IRON.

	1883.	1882.	Increase.	Decrease.
Tons.	Tons.	Tons.	Tons.	Tons.
Makers' stocks of Cleveland pig, port of Middlesbrough	165,161	138,010	27,151	.....
Makers' stocks of Cleveland pig, outside of Middlesbrough	32,545	30,827	1,718	.....
Makers' stocks of Cleveland pig, whole district	197,706	168,837	28,869	.....
Makers' stocks of Cleveland pig, whole district	21,015	25,662	.....	4,647
Pig iron in public stores: The N. E. R. Co.'s stores	6,645	7,063	.....	418
Connell's stores	81,870	85,283	.....	3,413
Total	307,741	307,745	.....	504

SHIPMENTS OF PIG IRON FROM PORT OF MIDDLESBOROUGH.

	1883.	1882.	Inc. on Feb. 1883.	Dec. on Feb. 1882.
Tons.	Tons.	Tons.	Tons.	Tons.
Shipments for export	40,532	37,605	3,340	12,808
Shipments coastwise	34,763	26,223	6,467	1,734
Total	75,295	63,828	11,467	14,542

* Including 1257 tons of pig iron other than "Cleveland."
† Including 1332 tons of pig iron other than "Cleveland."

SCOTCH PIG IRON

is very dull in the open market, the value of warrants having declined to 46/10 since my last report. There is scarcely any speculative movement in these securities, which are now lower than for a long time past. Makers' iron is only fractionally weaker, although the shipments are not satisfactory. The No. 4 brands of Scotch pig are nominally as last quoted by me, but they seem to be ineffectual in keeping out Middlesboro' pig iron. In Scotland there are now 110 furnaces (including 7 on hematites) at work, as against 107 a year ago. In Connal's Glasgow stores the quantity is 584,014 tons (a decrease on the week of 1045 tons) against 629,589 tons this date 1882. Shipments to date are only 7376 tons ahead of 1882, and the importations of Middlesboro' pig are 14,240 tons below last year to same date. Writing from Glasgow April 6, James Watson & Co. said: "The iron market has been very dull all the week, and the price of warrants is again lower, while quotations for makers' iron are likewise weaker, the demand being quieter all round. The Middlesboro' market is steady, with no alteration in price. On Monday the price of warrants fluctuated between 47/ and 47 1/2, cash, and on Tuesday the price relapsed to 47/0 1/2 1/2 ton. On Wednesday the market was very flat, with a good business done between 47/1 and 46/10, cash. Yesterday the market was closed, and to-day the price has been steady at 46/10 and 46/10 1/2, cash, closing with sellers at the latter figure. The shipments last week were 8500 tons, as compared with 10,107 tons for the corresponding week of last year." We quote:

G. M. B., at Glasgow	No. 1.	No. 2.
Clyde	48/6	46/6
Coltness	51/6	51/6
Langloan	51/6	51/6
Gairloch	51/6	51/6
Summerlee	51/6	51/6
Calder	51/6	51/6
Carnbroe	51/6	51/6

Glenarnock, at Ardrossan	55/	49/
Falinton	49/6	49/6
Dalmellington	49/6	49/6
Shotts, at L. 1/2	54/	56/
Kinned, at Bo'ness	48/6	47/6
Carron, at Grangemouth	59/6	59/6

WEST COAST HEMATITE PIGS

are virtually unaltered on the basis of my recent quotations. Mixed numbers, in usual proportions, are to be had at 51/ @ 52/6, and makers' brands as below, for ordinary lots—large purchasers might do better:

	No. 1.	No. 2.	No. 3.
Cleator	55/	55/6	55/
Lonsdale	54/	53/	53/
Workington	54/	53/	53/
West Cumberland	53/6	53/	53/6
Lowther	53/6	53/	53/6
Moss Bay	53/	53/	53/
Distington	53/6	53/	53/6
Harrington	53/6	53/	53/6
Solway	53/6	53/	53/6
Maryport	54/	53/6	53/

The make of the district is at the rate of about 32,450 tons weekly, and there are 55,000 tons in the West Cumberland Co.'s stores. The reserve is increasing rather rapidly. Last week's shipments included 14,155 tons of pig iron and 4890 tons of steel rails.

THE BOARD OF TRADE RETURNS

for the month of March are out-to-day. They show that the total value of our imports was £3,576,816, against £3,008,673 in March, 1882. The exports last month were of the aggregate value of £2,100,929, compared with £2,093,275 in March, 1882, and £19,131,038 in March, 1881. The total quantity of the iron and steel exports was 333,189 tons, worth £2,426,352, against 376,266 tons and £2,662,010 last year in the same month. The leading items of export last month were:

Arti-cles.	Quantities.		Values.	
	1883.	1882.	1883.	1882.
Firearms, small, No. 11, No. 12, &c., manufactures of, not being ordnance, &c.	20,099	18,719	£28,379	£24,233
Carriages—Railway for passenger, No. 11, No. 12, &c., not being ordnance, &c.	7,161	6,784	37,494	31,668
Railway trucks, wagons, &c., not being ordnance, &c.	.....	.....	30,574	31,146
Coal, &c., tons.	1,547,531	1,400,998	20,509	70,495
Copper, unwrought, cwts.	14,148	20,251	11,581	102,472
Wrought, &c., mixed or yellow metal sheathing, cwts.	21,131	29,541	39,053	115,791
Wire (except telegraph wire), tons.	21,633	30,390	77,776	117,413
Hoops and cutlery.	.....	.....	377,737	378,803
Pig iron & steel, tons.	162,369	178,799	441,575	532,315
Bar, angle, &c., tons.	24,621	21,461	137,847	168,756
Railroad, boiler.	71,191	83,280	48,792	53,163
Wire (except telegraph wire), tons.	8,072	4,458	125,658	74,793
Hoops, sheets, boiler and armor plate, tons.	27,378	27,114	313,739	301,012
Tin plates, tons.	21,143	20,254	370,004	379,794
Cast or wrought, tons.	27,135	30,741	397,294	408,213
Old for re-manufacture, tons.	10,109	4,208	58,334	14,425
Steel, unwrought, tons.	21,781	7,947	222,249	130,495
Manufactures of steel and iron, tons.	1,896	1,171	79,240	67,752
Lead, tons.	5,031	2,232	43,143	23,143
Steam engines.	.....	.....	200,770	305,407
Other descriptions of machinery and mill work.	.....	.....	601,084	714,841
Plate and plated and gilt wares.	.....	.....	32,161	24,815
Tel. wire & apparatus, tons connected there with.	.....	.....	38,371	150,526
Tin (unwrought), cwts.	8,072	7,749	96,937	57,123

TO THE UNITED STATES, MONTH OF MARCH.

Articles.		1883.	1882.
Alkali, cwts.	.....	285,596	.....
Hardware and cutlery, &c.	.....	34,205	.....
Iron—Pig, tons	.....	32,547	.....
Bar, angle, rod, &c., tons	.....	969	.....
Railroad, all, tons	.....	4,937	.....
Hoops, sheets, plates, &c., tons	.....	2,280	.....
Tin plates, tons	.....	16,021	.....
Cast or wrought, tons	.....	414	.....
Old, tons	.....	2,173	.....
Steel, unwrought, tons	.....	4,708	.....
Lead, all sorts, tons	.....	63	.....
Steam engines, &c.	.....	5,246	.....
Other machinery, &c., &c.	.....	49,734	.....
Tin, unwrought, cwts.	.....	247	.....
Special return—iron rails, tons	.....	979	.....
Steel rails, tons	.....	3,712	.....

The following return of the exports of steel and cutlery from Sheffield to the United States has been prepared by Doctor Webster, United States Consul. It shows a remarkable falling off in steel, a decrease largely owing to the smaller business done in blooms and rails of late:

	Steel.		Cutlery.		Total export.	
	£	d.	£	d.	£	s. d.
January, 1883...	28,245	8 7	22,539	9 4	75,003	16 5
February, 1883...	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1883.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1883..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1882....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1882....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1882.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1882..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1881....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1881....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1881.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1881..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1880....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1880....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1880.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1880..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1879....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1879....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1879.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1879..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1878....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1878....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1878.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1878..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1877....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1877....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1877.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1877..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1876....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1876....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1876.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1876..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1875....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1875....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1875.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1875..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1874....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1874....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1874.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1874..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1873....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1873....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1873.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1873..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1872....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1872....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1872.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1872..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1871....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1871....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1871.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1871..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1870....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1870....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1870.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1870..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1869....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1869....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1869.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1869..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1868....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1868....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1868.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1868..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1867....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1867....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1867.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1867..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1866....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1866....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1866.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1866..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1865....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1865....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1865.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1865..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1864....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1864....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1864.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1864..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1863....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1863....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1863.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1863..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1862....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1862....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1862.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1862..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1861....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1861....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1861.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1861..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1860....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1860....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1860.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1860..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1859....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1859....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1859.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1859..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1858....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1858....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1858.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1858..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1857....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1857....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1857.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1857..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1856....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1856....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1856.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1856..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1855....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1855....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1855.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1855..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1854....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1854....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1854.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1854..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1853....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1853....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1853.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1853..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1852....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1852....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1852.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1852..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1851....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1851....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1851.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1851..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1850....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1850....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1850.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1850..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1849....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1849....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1849.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1849..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1848....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1848....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1848.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1848..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1847....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1847....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1847.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1847..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1846....	30,145	16 3	17,317	16 1	66,722	6 10
February, 1846....	26,111	11 1	15,312	17 1½	63,597	7 1½
March, 1846.....	46,039	1 2	23,330	0 11	104,960	5 10
Quarter ending March 31, 1846..	102,295	8 6	56,000	15 11	258,505	6 11
January, 1845....	28,245	8 7	22,539	9 4	75,003	16 5
February, 1845....	26,160	8 1	15,777	9 0	63,175	5 5½
March, 1845.....	30,334	8 3	24,720	10 0½	66,456	4 1½
Quarter ending March 31, 1845..	85,469	4 1	62,737	15 8½	204,655	6 4
January, 1844....	30,145	16 3	17,3			

SANDERSON BROS., LIMITED,

some years ago transferred their American business to American soil, locating their works, if I remember rightly, at Poughkeepsie, N. Y. The annual meeting of the company took place at Sheffield on April 8, Mr. Bernard Wake presiding. A report was presented as to the American business, and a dividend of 3 % for the half year—making 6 % for the year—was declared on that portion of the capital. On the English undertaking, which some time ago absorbed R. Newbould & Co., the shareholders being the same in each case, a bonus of 5 % was declared, making a dividend for the year of 10 %. It would thus seem that capital gets better interest in England than in the States.

SOME CURRENT PRICES ARE:

	Per ton.	Per ton.	Per ton.
Chili slab for prod. 65 %	£ 4	s. d. £ 4	s. d.
"Good ordinary brands	£ 4	s. d. £ 4	s. d.
"Picked brands	£ 4	s. d. £ 4	s. d.
"Best brands	£ 4	s. d. £ 4	s. d.
Burma cake	£ 6	s. d. £ 6	s. d.
Wallaroo cake	£ 7	s. d. £ 7	s. d.
Brass sheets (4 x 4)	£ 7	s. d. £ 7	s. d.
Ordinary sheets, other sizes	£ 7	s. d. £ 7	s. d.
Ordinary locomotive plates	£ 7	s. d. £ 7	s. d.
and bolts	£ 7	s. d. £ 7	s. d.

Rolled flat bottoms for	77	00	@	78	00	0
Egypt, &c.	68	10	@	69	10	0
Tough cake and ingot	70	00	@	71	00	0
Best selected ingot	70	00	@	71	00	0
Yellow metal, braziers	6	@	6	@	6	@
Yellow metal sheathing and bolts	6	@	6	@	6	@
Ores and rebus Liverpool or Swansea, unit.	12	9	@	13	3	0

English common blocks and	Per cwt.
Ingots	100 00 @ 100 100
Eng. com. bars, in barrels	100 100 @ 100 100
Fine Straits & Australian	100 00 @ 100 00
cash. Fine Straits and Australian, forward	95 00 @ 96 30

TIN PLATES.	Per box.
"CWM" Fells best char-coal I.C.	21 3 @ 21 6
"Mill" Wood & qual char-coal I.C.	20 3 @ 20 6
"CWM Fells" best coke, I.C.	17 9 @ 18 0
"CF Abertawe" coke, I.C.	16 9 @ 17 0

IRON.	Per ton.
Welsh bars, in Wales	5 15 @ 6 00
Welsh bars, in London	6 5 @ 6 10
Staffordshire bars, in Lond.	7 00 @ 8 50
Staffordshire nail rods, in London	6 12 @ 7 26
Staffordshire hoops, in London	7 50 @ 8 10
Staffordshire sheets, in London	8 10 @ 10 50
Swedish iron	9 10 @ 10 50

SPELTER.	Per ton.
Ordinary Silesian on the spot	15 10 @ 15 10
Special Silesian on the spot	15 10 @ 16 50
ZINC.	Per ton.
Sheet, No. 9, 20 and upward	20 00 @ 21 00

LEAD.	Per ton.
English pig, usual shipping brands	13 7 @ 13 15
English sheet	14 10 @ 14 15
Spanish, soft, without silver	13 00 @ 13 26
Quicksilver, in bottles of 75 lbs. each, bottle	5 12 @ 6 00
Regulus of antimony, 1/2 ton	40 00 @ 40 00
1/2 Liverpool or Swansea	40 00 @ 40 00
1/2 1/2 ton less in Liverpool	40 00 @ 40 00

Proposed New Lighthouse in Lower Delaware Bay.—The Fourteen-foot Bank in the Lower Delaware Bay, between the Brandywine and Cross Ledge Shoals, has had for years stationed upon it a light-ship. Owing to the heavy flow, it has been found almost impossible to keep this lightship in position, especially in the winter months, when most needed.

In order to secure the permanent location of this beacon, as well as to guide vessels not only clear of the Fourteen-foot Bank, but also from the lower end of the Joe Flogger Shoals, the Lighthouse Board has decided to erect a lighthouse on this spot. There are peculiar engineering difficulties surrounding this project, since there is a depth of 21 feet of water over the Fourteen-foot Bank, and then a depth of some 23 feet of quicksand to get through before a solid stratum of clay suitable for foundation can be reached, there being no rock bottom at this point. The plans of the engineers under consideration at the present moment comprise a caisson 50 feet in diameter at the base, 30 feet diameter at the top and 43 feet in height. It is proposed to build the caisson of cast-iron plates made separately and bolted together on the inside by flanges, the outside surface being smooth and regular. There is now available an appropriation of \$175,000 for the prosecution of this work. It is proposed to float the caisson into position by means of a "camel," and by pumping the water into this latter to gradually sink the caisson to its foundation level. The pump to be employed for this purpose is designed for a capacity of 500 gallons per minute. From present indications it would seem as if the contracts for the work would be given out before the close of the present year.

Death of Charles Fanning.—Charles Fanning, until lately of the old metal firm of Lucius Hart & Co., died at his residence, No. 15 West Fifth street, on Tuesday evening. He was born in the Seventh Ward of this city, on July 22, 1822. He received a liberal education, having been intended for the ministry, and graduated with honors from the Union Theological Seminary. He entered upon the ministry at Belvidue, Ill., and remained thus engaged for several years, when a trouble with his throat caused him to give up this occupation. He then returned to this city and entered into business with Lucius Hart, metal dealer, Burling Slip, which firm subsequently became Lucius Hart & Co. He remained a member of the firm until last December, when he retired from all active participation therein. He was a member of the Iron and Metal Exchange of Wall street, which institution took suitable action with regard to his death. Mr. Fanning was taken sick several weeks ago and died from fatty degeneration of the heart. The funeral will take place on Friday morning from the West Presbyterian Church.



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Steel is Fast Taking the Place of Iron in all Mechanical Tools.

At a slight extra cost it adds largely to the strength and efficiency of Jack Screws. It would be of great benefit to both dealers and consumers, if Steel Screws should at once come into use, as they cost only 10 per cent. more for the same size, and will probably do 50 per cent. more work. We have Steel Screws on hand of most sizes, and will make anything on our list at short notice.

For size and price see our catalogue for 1883, a copy of which will be sent on request.

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JOHN C. KELLEY, President,

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THE HENRY B. NEWHALL CO., 105 Chambers St., New York, and 47 Pearl
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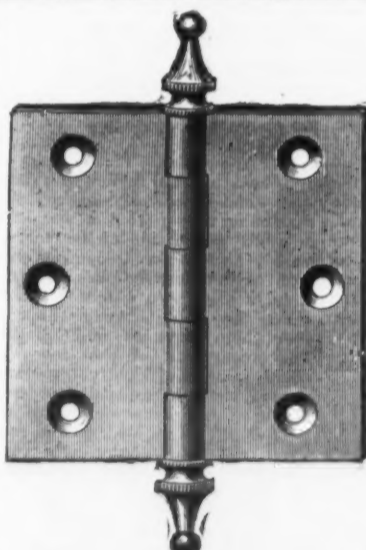
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ing ribs cast inside, which strengthen the jaw
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and strongest Wrench in the market. None
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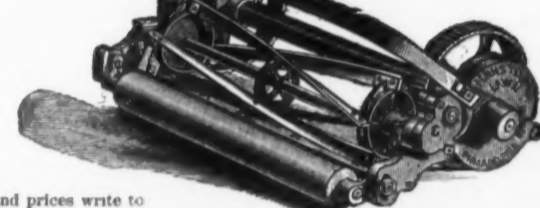
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1883.

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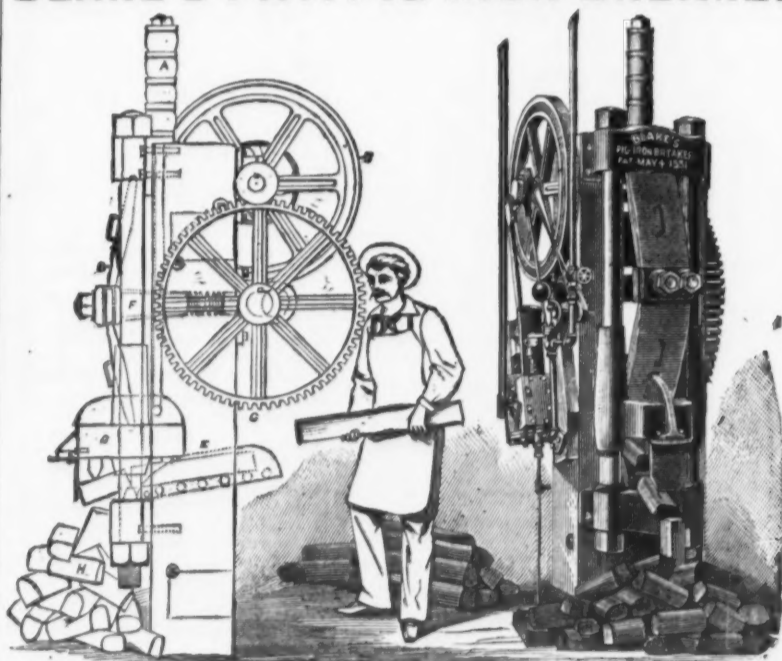


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INDUSTRIAL ITEMS.

NEW HAMPSHIRE.

The Excelsior Mills and file works at Livermore Falls, Plymouth, are driven with work, the former running night and day.

MASSACHUSETTS.

The Chapman Valve Co., of Northampton, are about to commence the erection of a new foundry, which will be 150 x 60 feet, with an L 100 x 30, and sand sheds 100 x 15.

Additions have recently been made to the machinery of the Union Needle Works, at Middleboro', which will increase the output of that concern 50 per cent.

RHODE ISLAND.

The Builders' Iron Foundry, of Providence, are doing as much business as ever. They are netting about 15 tons of iron per day on the average, and turning out a great variety of products. They recently shipped to the Boston Machine Co. a planer-bed 43 feet in length and but 22 inches between the tracks. They melted a few days ago 4 tons of iron in 35 minutes in a 36-inch cupola, using $\frac{1}{2}$ ton of fuel. This is thought to be pretty quick time. They manufacture the Armington & Sims engine in the larger sizes.—*Boston Commercial Bulletin.*

CONNECTICUT.

The difficulties lately existing among the stockholders of the Wilson Sewing Machine Co., at Wallingford, have been settled. A large amount of stock has been taken by Arkansas parties, and it is believed that manufacturing will be begun July 1. Arrangements have been made to remove the manufacturing facilities from Chicago to Wallingford, and this will take a month or six weeks.

The gun factory of Parker & Brother, in Meriden, is receiving an addition of 68 x 38 feet and three stories in height.

NEW YORK.

Stack No. 2 of the Franklin Iron Mfg. Co., Oneida County, was blown out for repairs March 23, after a successful blast of three years and three months. The repairs in progress include raising the stack from 54 to 70 feet, the erection of regenerative stoves, 18 x 60 feet, under the supervision of John M. Hartman, and erecting two blowing engines, 84 and 40 inches by 4½-foot stroke, made by the Cuyahoga Works, Cleveland, Ohio. No. 1 furnace is in operation, making 300 tons foundry iron per week.

PENNSYLVANIA.

At the assignee's sale of the Lancaster Rolling Mill, at Rohrerstown, the property was purchased by the manager of the Speedwell Farms, belonging to the Coleman heirs, for \$8000. It is said the mill will be idle. The building is 175 x 90 feet, and has in it three steam engines, seven puddling furnaces, heating furnace and all the necessary machinery for the manufacture of iron. The works were purchased and enlarged in 1872 by M. McShain & Co., of Hempfield, the late owners.

The works of the Milldale Iron Co., at Port Clinton, Schuylkill County, are still idle, with no prospect of resumption.

The Parkesburg Iron Co., at Parkesburg, Chester County, are building a large addition to their works, and are very busy.

Marietta Furnace No. 1 will soon be put in blast.

The Lochiel Rolling Mill property, at Harrisburg, has been sold to Senator Don Cameron for \$100,000. It is said that the purchase was made for the Harrisburg and Western Railroad, on which to establish the shops of the company. The furnace was not included in the sale.

The Lehigh Car Mfg. Co., at Stemton, Northampton County, whose shops have been idle several weeks for want of orders, have contracted with the Lehigh Coal and Navigation Co. for the erection of 500 coal cars. Work was resumed last week.

On Saturday a large spur-wheel for an engine was cast at the steel works of the Cambria Iron Co., in Johnstown. The mammoth ladle when swung for duty contained upward of 20 tons of molten steel, 15 tons of which were poured without the slightest obstacle intervening. We believe that this is the first attempt at so large a cast of Siemens-Martin steel.

The Connellsville and Ursina Coke Co., recently organized with \$400,000 capital, have purchased 7000 acres of land in Somerset County.

McLanahan, Smith & Co.'s nail factory at Hollidaysburg has been compelled to shut down on account of their rolling-mill strike.

PITTSBURGH AND VICINITY.

Articles of incorporation of the Love Mfg. Co., of Pittsburgh, have been filed at Harrisburg. The capital stock is \$500,000, divided into shares of \$100 each. The purpose of the company is to manufacture a sewing machine invented by Samuel Y. Love. They have purchased the old coffin works at Rochester, and now have a large force of mechanics employed in turning out the necessary tools. It will probably be July 1st before they will begin to manufacture to their full capacity—200 machines per day.

The failure of James Marshall & Co., referred to elsewhere, was one of the heaviest breaks ever made in Pittsburgh. The secured creditors are chiefly banks and insurance companies of that city and vicinity. The unsecured creditors, who bear the brunt of the losses, are chiefly furnacemen. The heaviest losers will be Hogsett, Hanna & Co., who lose \$95,000; Marshall Bros., of Philadelphia, will lose \$32,000. This leaves \$173,000 of loss to be divided between Fairhance Furnace Co.; Fayette Brown, receiver of Brown, Bonnell & Co.; Youngstown; the Dunbar Furnace Co. and the Rockhill Furnace Co.

The French Spiral and Spring Co., Limited, located on Liberty street, are engaged in digging and making the foundation, at the corner of Twenty-fifth and Smallman streets,

for a new iron building, 300 feet long and 125 feet wide. The firm will manufacture their own steel for their old works.

The new plate and sheet mill now being erected by the Republican Iron Co. at the Wharton Mill, will probably be completed and in operation about May 1.

The finishing department of the Elba Iron and Bolt Co., Limited, was started on April 18 for the first time since the fire last year.

MARYLAND.

A Baltimore dispatch, dated April 21, is as follows: Thomas H. Paul & Sons a few months ago began to build in this city an extensive locomotive works. For a number of years the firm carried on locomotive building at Cumberland, Md. The new shops are now nearly completed and filled with machinery, and much surprise was created in business circles to-day when the firm filed a deed of trust for the benefit of the Second National Bank of Cumberland, having a claim of \$7500; Keyser Bros. & Co., of Baltimore, \$5000, and Jacob Humbird, of Cumberland, \$2000. The trustee is directed to apply the assets first to the payment of the partnership debts, including the workingmen, then to the payment of the individual debt of the preferred creditors, and the balance to the settlement of the general liabilities. The liabilities are estimated at about \$35,000 and the nominal assets placed at \$50,000. If possible a satisfactory arrangement will be made by which the works can begin operations, as about 200 men would be given employment.

OHIO.

The shovel works of Wm. Chisholm & Sons, of Cleveland, are running to their ordinary capacity—100 dozen a day. The shovel trade is rather slack at present on account of the dullness in the iron market and the restriction of output in the Lake Superior mines. The firm do not expect a heavy trade this season, and reports to live effect come from the Oliver Ames Co.

The Cummer Engine Co., recently started up at Cleveland, employ about 175 men, and will gradually increase their force to 300 men, the full capacity of their present plant. The factory, when completed and equipped, will consist of two molding-rooms, 300 x 80 feet, and a machine-shop, 400 x 60 feet, two stories. Altogether the buildings and grounds will be 400 x 350 feet, and accommodate 500 workmen.

The largest manufacturing establishments in Springfield are the five engaged in making Champion mowers and reapers, viz.: Whitley, Fassler & Kelley, the Champion Machine Co., Champion Bar and Knife Co., Champion Malleable Iron Co. and Warder, Bushnell & Glessner. Taken altogether, they form the most extensive agricultural machine shops in the world. The new shops of Whitley, Fassler & Kelley will employ over 2000. The capacity of this concern is 600 machines from sunrise to sunset—an annual production of 100,000 implements. Included in this establishment will be a large rolling mill and steel works.

The stone foundations for 60 nail machines at the new Kelly mill, Ironton, are completed, and those for the remainder will be soon finished. The framework is going up.

The Lake Shore Tube Works Co. is the title of a company composed entirely of attaches of the National Tube Works Co., of McKeesport, Pa., formed for the purpose of operating a tube works at Cleveland which has been idle for a time. Although owned as stated, it will be run as an independent concern, not using any of the National Tube Works Co.'s patents. No pipes will be made larger than 1½ inches. Mr. W. L. Hurd, who has been connected with the old company in McKeesport since its advent, owns 25 shares, and has assumed the general management. John H. Flagler, trustee, owns the controlling interest, 105 shares. No other stockholder has over 50 shares.

Sensational specials have been telegraphed that the Cleveland Rolling Mill Co. have shut down part of their works, throwing a large number of men out of employment. The simple fact is, owing to having a stock of Siemens-Martin steel ahead, they stopped that furnace last Monday week, laying off 25 men. Work will be resumed this week.

The factory of the Brilliant Glass Works, at Steubenville, has been leased to the Riverside Glass Co., of Wellsburg, W. Va., for a term of 60 days. The works will be put in operation this week. Receivers were appointed by the court in the case of the Brilliant Glass Works.

So crowded are the Cleveland Twist Drill Co. with orders that they are still adding machinery.

ILLINOIS.

The Gardner Governor Works have been incorporated as the Gardner Governor Co., and have begun to build entirely new works.

The Kewanee Mfg. Co., of Kewanee, will soon increase their output of windmills by an extensive addition to their main shop.

The Calumet Iron and Steel Co. blew in their furnace at Cummings on April 17.

The Chicago Scale Works are increasing their capacity, and will soon build a new factory.

The Western Electric Light Co., of Chicago, are laying the foundations of their new \$80,000 factory.

President Potter, of the North Chicago Rolling Mill Co., is reported by telegraph as saying that the mills would not be started while the present prices continued, and if they could not be started in six months they would never resume. He believes a general leading of prices will be made to meet the decline in iron. Two thousand men have been thrown out of work by the stoppage of the North Side mills, and 1800 by the stoppage of the South Side mills, and there is great suffering among the idle laborers.

At a meeting of the stockholders of the Union Iron and Steel Co., held in Chicago last week, an increase of \$1,400,000 capital was authorized—the increase to be preferred stock. Mr. Henry A. Gardner was elected president to fill the place made vacant by the

resignation of Amasa Stone. An offer was made to compromise all indebtedness at 50 per cent. in increased stock, and 50 per cent. in the notes of the company, at six months, bearing 6 per cent. interest. Half of the creditors agreed to the proposition, and the company hope to start the works by June 1 if two-thirds of the number will give their assent. The total indebtedness of the Union Company is shown to be exactly \$2,000,000. The \$600,000 worth of preferred capital stock remaining after Amasa Stone is provided for represents \$1,200,000 indebtedness. This sum, plus Amasa Stone's, is \$2,000,000. This indebtedness may be distributed about as follows:

Amasa Stone	\$200,000
Connecticut Mutual Insurance Co.	200,000
New York banks	200,000
W. H. Barnum	137,000
Russell Sage	137,000
Other small creditors	343,000
Total	2,000,000

KENTUCKY.

Ashland Furnace is making about 53 tons per day.

MISSOURI.

The St. Louis Wire Mill Co. have completed and put in operation their new galvanizing works. They are running double turn.

It is stated that the Excelsior Foundry and Plating Co., of St. Louis, will shortly enlarge their works, as their business is very brisk at present, and they have twice as many orders as they can handle.

The Whitman Agricultural Co. also propose an extension of their works, and have leased ground for that purpose.

The Missouri Malleable Iron Co. have just completed their new works and started up. Their specialty is a line of superior wagon, plow and carriage malleables. They now employ 75 men, but will soon increase their force.

On the night of April 21, the works of the St. Louis Stamping Co. were struck by lightning, and a fire ensued which did much damage. The stock, however, was untouched, and the establishment was not compelled to shut down entirely. The loss is estimated at \$50,000.

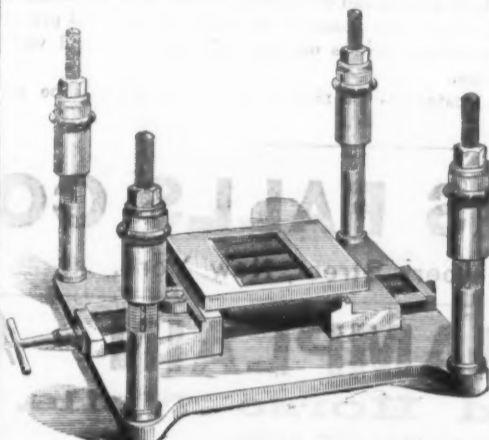
Fire-Doors for Mills.

A simple automatic fire-door in use by the mills insured under the Boston Manufacturers' Mutual is worth describing for its moral. Thirty years' experience having found that the best, or one of the best, fire-resisting materials for doors is well-built pine covered on both sides with tin so closely as to admit little air underneath, in which case the charcoal into which the surface of the wood is converted by heat itself becoming a resistant, the duty of hanging such doors is plain and easy. But as the best door must be opened in use, and like the collision doors in a steamship, is valueless if left accidentally open, the problem is to insure that the fire-resisting doors shall never be found open when the fire reaches it. This is most simply accomplished. The door slides, being hung on wheels rolling on an inclined rail at the top, so that its own weight closes it. Two doors are used, one on either side of the opening in the brick wall, the air space between being the best resistant. In the daytime a latch projecting from the inner side of the casing holds each door open, and if the doors are left so over night nothing happens, unless fire occurs. If fire does occur, the first heat melts a fusible link inserted in a wire which extends across the doorway; the wire being thus parted, a weight contained in a box at the side of the doorway is released, and in its descent it shoves back both of the door catches; the doors then close by their own weight. The casing into which they shut is wedge-shaped, and laps over their edges to make a close joint. The momentum of the doors jams their edges somewhat tightly into these wedge-shaped cavities, and also presses all the edges of the doors snugly up against the wall itself. The heat of the fire not only shuts the doors, but starts an automatic sprinkler, which plays water into the space between the doors. The alloy with which the two parts of the wire are kept together can be wrapped in a lock of raw cotton and melted in the flame of a lamp without scorching a fiber of the cotton. The same device may be used for window shutters, the shutter being inside of the window and the fusible link outside, the latter being so sensitive that it will yield to the heat outside before the glass will. The ordinary iron shutter on hinges and locked inside has repeatedly proved itself a treacherous ally, as it not only fails to be a protection against fire getting through from the outside, but is a serious hindrance to firemen when they need an entrance. The automatic window or door, as described, has no particular novelty, the fusible link being the essential working part of all automatic sprinklers and alarms, but the moral conveyed is of vast value. That the devices and conditions which have made mutual factory insurance so extraordinarily successful in Massachusetts are not all practicable in general—or in "the dry-goods district" especially—is true, and there is the great obstacle to making the mutual system general; but the great features of study, investigation of causes, recording and arguing from all the facts of experience, and intelligent adoption of the details of construction which prevent fire, are capable of being copied in some degree at least. A huge store which is really a stove well provided with flues and stuffed with fuel all ready, is a model to be abandoned.

At a recent meeting of ironmasters of the North of France it was decided to adopt measures for reducing the production, prices to remain unchanged. The same method is to be applied by the Longwy group, and on April 1 five furnaces in that district were blown out for a year. The annual production will thus be reduced 60,000 tons at Longwy and 40,000 tons at Nancy, or 100,000 tons in all, which reduction, it is hoped, will allow of the absorption of the not very important stocks which have accumulated.

Portable Valve Chuck.

The L. B. Flanders Machine Works, 1025 Hamilton street, Philadelphia, Pa., have just brought out a new tool particularly adapted for use in locomotive repairs, and likely to greatly facilitate the work in the round-house and repair shops. It is built to suit different sizes of their valve-seat rotary planing machines. The tools built by these works have had an enviable reputation, and whatever they produce is likely to receive most careful attention from railway men. In this case the tool is provided, as will be seen from the cut, with a pair of movable jaws working in dovetailed slides. These jaws are operated by a right and left hand screw, which brings them up central and at the same time firmly clamps the back of the valve and holds it in a central position for planing. The uprights seen at the four corners of the base plate have about 2 inches of adjustment, with graduations which enable the machine to be set parallel with the table. With this, in combination with the valve-seat rotary planer, the work can be done in an exceedingly short length of time. The manufacturers suggest that it would be a



Portable Valve Chuck.

very desirable practice to plane off the backs of valves, since this would facilitate very much the setting of the valves in the chuck. They could then, of course, be set parallel with the table at once.

The Civil Engineer.

The following description of the civil engineer was written by Tredgold when an honorary member of the British Institution of Civil Engineers, at the request of the council: "Civil engineering is the art of directing the great sources of power in nature for the use and convenience of man, being that practical application of the most important principles of natural philosophy which has, in a considerable degree, realized the anticipations of Bacon, and changed the aspect and state of affairs in the whole world. The most important object of civil engineering is to improve the means of production and of traffic in States, both for external and internal trade. It is applied in the construction and management of roads, bridges, railroads, aqueducts, canals, river navigation, docks and shorehouses, for the convenience of internal intercourse and exchange, and in the construction of ports, harbors, moles, breakwaters and lighthouses, and in the navigation by artificial power for the purposes of commerce. Besides these great objects of individual and national interest, it is applied to the protection of property where natural powers are the sources of injury, as by embankments for the defense of tracts of country from the encroachments of the sea or the overflowing of rivers; it also directs the means of applying streams and rivers to use, either as powers to work machines or as supplies for the use of cities and towns, or for irrigation, as well as the means of removing noxious accumulations, as by the drainage of towns and districts to prevent the formation of malaria and secure the public health. This is, however, only a brief sketch of the objects of civil engineering; the real extent to which it may be applied is limited only by the progress of science; its scope and utility will be increased with every discovery in philosophy, and its resources are unlimited, and equally so must be the researches of its professors.

"The enterprising Hollanders toward the close of the sixteenth century first separated civil engineering from architecture, under the title of hydraulic architecture; their example was followed in France toward the end of the seventeenth century, and soon afterward was systematized in the great work of Belidor on "Hydraulic Architecture." One of the great bases on which the practice of civil engineering is founded is the science of hydraulics; every kingdom, every province, every town, has its wants, which call for more or less acquaintance with this science. Water, which is at once the most useful of the necessities of life, and the most dangerous element in excess, when limited by the laws of this science is rendered the best of servants; the rolling cataract which spends its powers in idleness may be directed to drain the mine, to break the ore, or be employed in other works of labor for the use of man; the streams are collected and confined in canals for inland traffic; harbors are formed to still the raging of the waves of the ocean, and offer a safe retreat to the storm-driven mariner; and ports are provided with docks to receive the riches of the world in security—hence arose the term hydraulic architecture; but it was too limited; the various applications of water had rendered the natural supplies inadequate to the wants of man, till he discovered that, combined with heat, it formed a gaseous element endowed with energies not less powerful than the falling cataract; its steam, confined and directed by science, became a new source of power, which in a few years altered and improved the condition of Britain, and we are every day witnessing new applications, as well as the extension of the older ones, to every part of the globe.

Judging from recent accounts, there is now growing up on the banks of the River Tyne, in England, an establishment which,

it is stated, promises to bear comparison with Krupp's enormous works at Essen, Germany, in addition to a shipbuilding yard capable of turning out vessels of war of the largest size.

Freight Cars and Heavy Locomotives.

Heavy locomotives for freight traffic appear in some quarters to meet with less favor than is generally supposed. A prominent railroad superintendent, in fact, is said to have recently made the prediction that in 10 years from now heavy locomotives of the mogul and consolidation types would be used only on very hilly roads. He had for some time kept a careful account of the cost of repairs to freight cars that were properly chargeable to this class of engines, as well as extra repairs to tracks, and accidents from spread rails caused by the excessive weight, and found that it exceeded the saving in trainmen's wages and the interest on the cost of the extra number of lighter eight-wheeled engines necessary to do the same work, to an extent that he was really afraid to mention. The heavy engines pulled out, in freight work, three draw-bars where the lighter engines pulled out one; and the floor framing of cars hauled exclusively by the former was racked and loosened more in a single year than it would be in five years with the latter. With the lighter engines 30 cars were a load, while with the heavy ones 60 cars were now considered about the thing. This superintendent also asserted that if there is an average of 8 inches slack between the draw-heads in a train of 60 cars, a consolidation engine, or "hog," as it is called out West, will, in starting the train, travel 40 feet before the last or rear car moves, the engine, of course, acquiring a headway in the meantime of from two to three miles an hour, the result being that the rear car, weighing, with its load, say 32 tons, is jerked from a dead stand-

still to a speed at which the engine is moving. If such speed is at the rate of three miles an hour, the effect of the sudden jerk upon the car can be easily imagined. "The floor framing of freight cars," he continued, "has not been increased in strength and in the size of timbers in proportion to the increase in the power of the engines by which they are hauled, and the result is that the cars are racked to pieces in a year. You cannot," he further said, "stall one of our big 'hogs.' When the reverse lever is thrown ahead after taking the slack, and the 'hog' starts, there is no stopping her (him?) with cars. The only limit is the strength of the couplings, and away back in the train somewhere, especially if it is a long one, a coupling breaks, the engine, like a genuine hog, biting off, as it were, the forward portion and moving on."

We are informed that one of the older railways of this country will send to the Railway Exposition at Chicago a section of T-rail which has been in continuous use from 1838 to the present time. It is also intended to accompany it with statistics showing the total tonnage which has passed over it during its 45 years of service.

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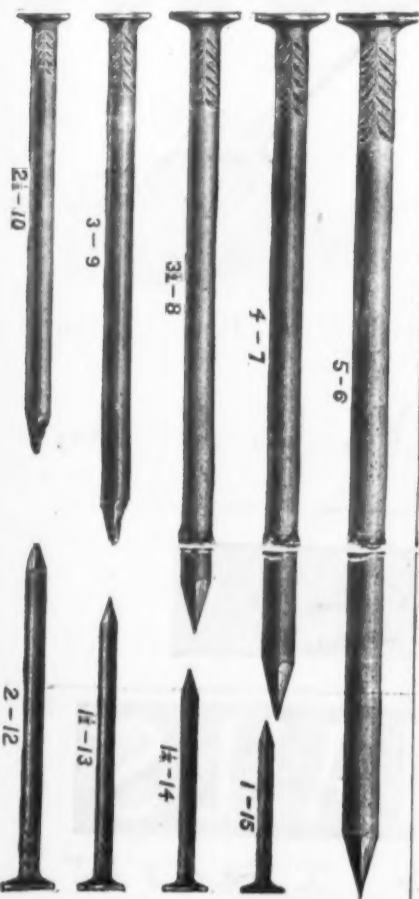
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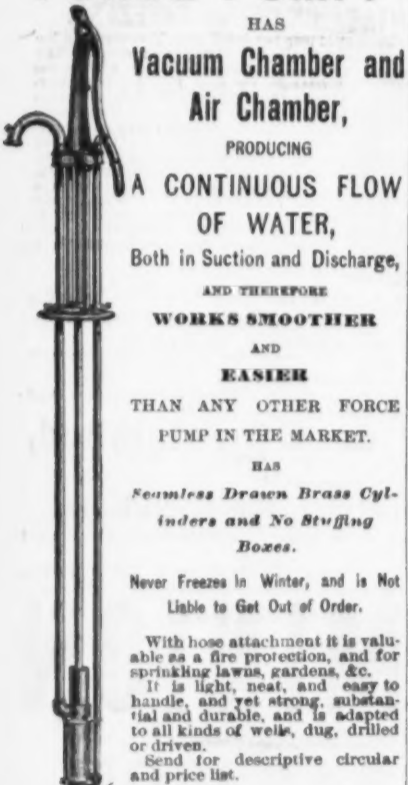


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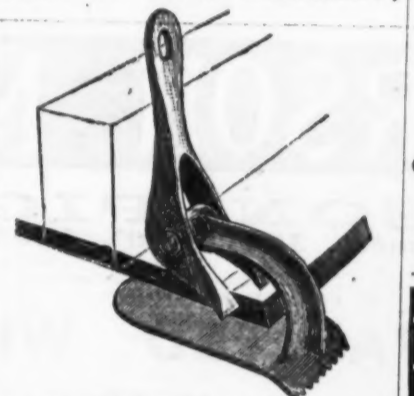
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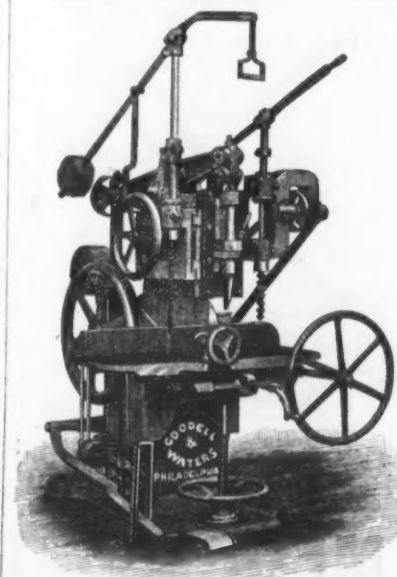


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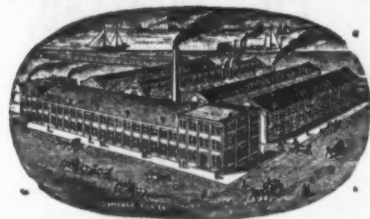
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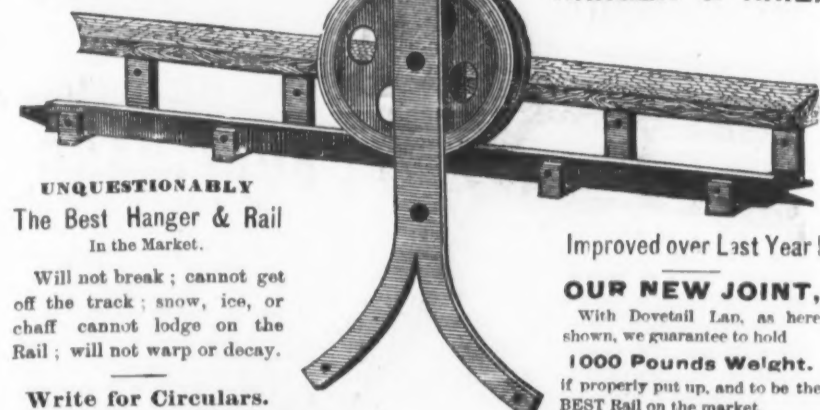


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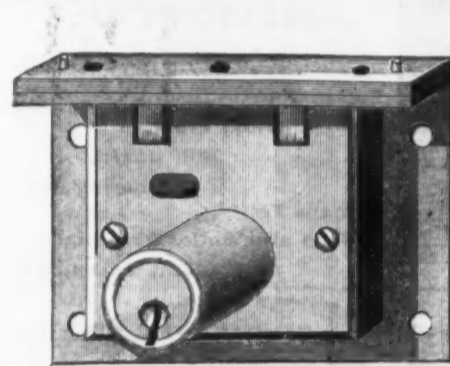
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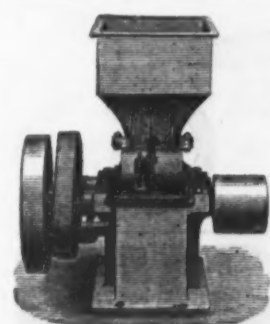
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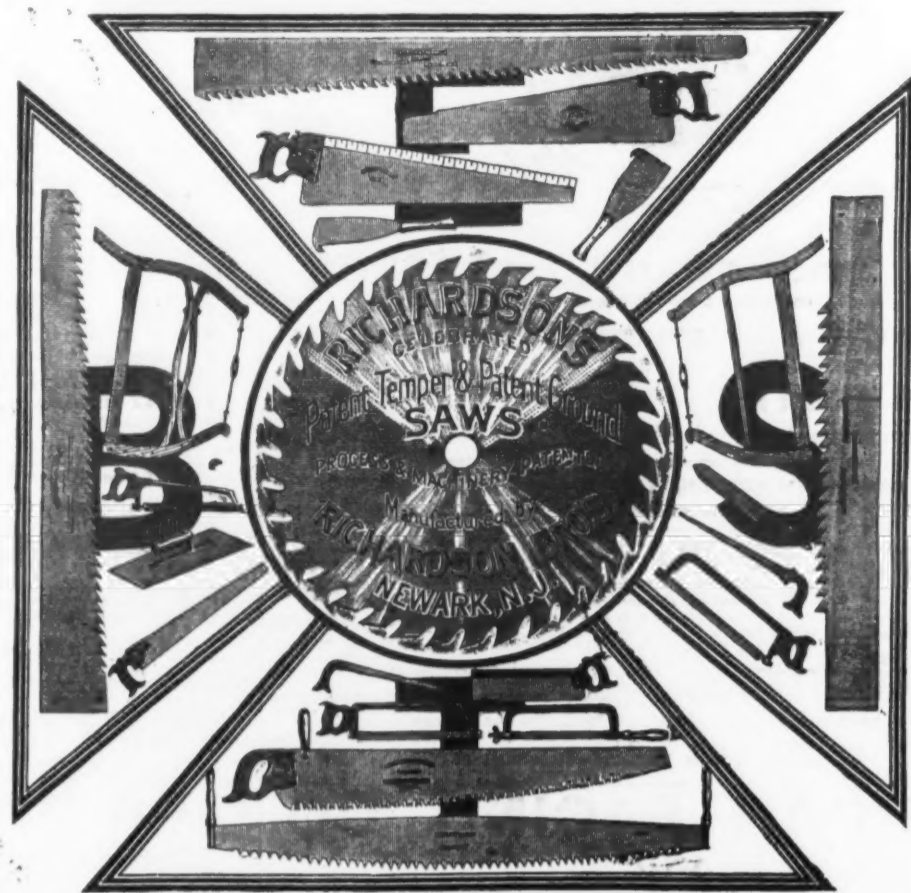
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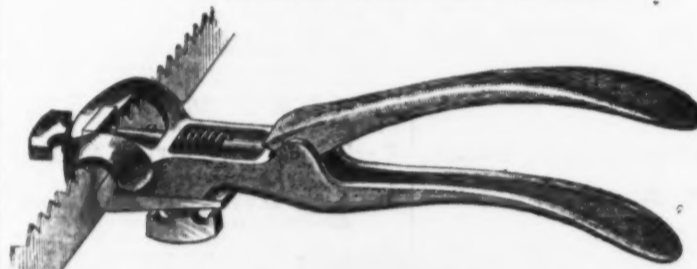
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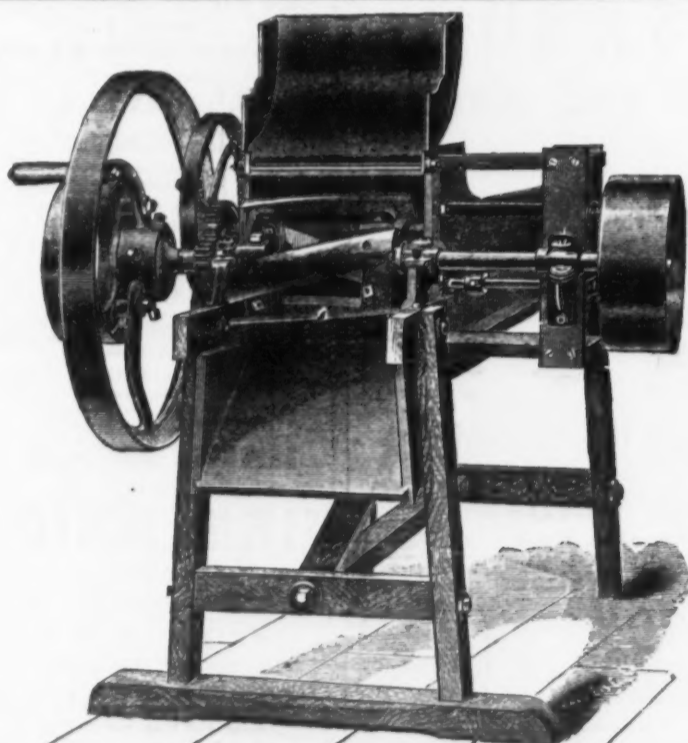
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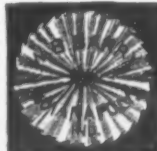
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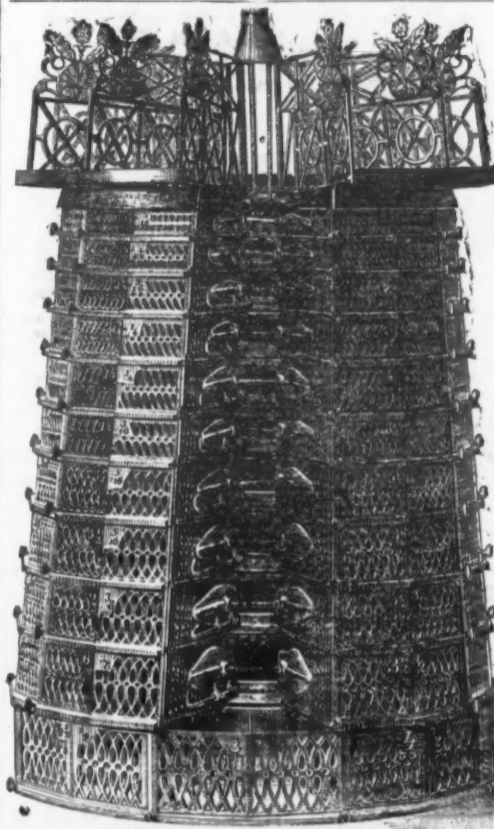
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Belt Oil.

Post E. L. & Co., 10 Peck Slip, N. Y. 17

Belt Protectors.

Lewis Edward S., Albany, N. Y. 46

Bicycles.

Yost Mfg. Co., 97 Washington, Boston, Mass. 44

Bird Cages, Makers of.

Gunther G., 45 Park Place, N. Y. 3
Jewett John C., 30 Buffalo, N. Y. 35
Lindeman O. & Co., 20 Park Row, N. Y. 13
Maxheimer John, 27 and 29 Park Row, N. Y. 13
Pierce Geo. N. & Co., Buffalo, N. Y. 20

Bits, Belt Hangers, Telephone and Chair Makers.

Hynes, David, 4 Murray, New York, N. Y. 18

Blasting Materials.

Hercules Powder Co., Cincinnati, O. 29

Black, Tackles, Makers of.

Bagnall & Co., Boston, Mass. 41
McCoy & Sanders, 50 Warren, N. Y. 41
McMillan Wm. H. & Bro., 133 South, N. Y. 41
Michigan Block Works, Detroit, Mich. 27
Knoblock Block Works, Detroit, Mich. 27

Block, How to Keep Clean.

Hutchins J. F., 30 John, N. Y. 28

Boilers, Steam.

Edge Moor Iron Company, 20 Liberty, N. Y. 17
Harrison Boiler Works, Philadelphia, Pa. 17
Low & Watson, Bridgeport, Conn. 17
McNell, James & Co., Pittsburgh, Pa. 16

Bolt and Nut Chippers.

Chambers, H. & Co., Philadelphia, Pa. 35

Bolt Cases.

Westphal Henry, Chicago, Ill. 39

Bolt Cutters.

Howard Iron Works, Buffalo, N. Y. 29
Novelty Iron Works, Cleveland, Ohio 27
Bridges Wm. & Co., Philadelphia, Pa. 27
Wiley & Russell Mfg. Co., Greenfield, Mass. 39

Bolts.

Wm. H. Russell Mfg. Co., Lowell, Mass. 40
Moore, S. H. & E. Y., Chicago, Ill. 41
Pawtucket Mfg. Co., Pawtucket, R. I. 28

Boring Machines.

W. H. Wells & Co., Ashaway, R. I. 38

Bones for Hangers.

Green S. H., 12 Murray, N. Y. 38

Brass, Manufacturers of.

Ansonia Brass and Copper Co., 19 Cliff, N. Y. 26
Bridgport Brass Co., Bridgeport, Conn. 26
Brown & Bros., 31 Chambers, N. Y. 26
Cook & Wilson, Newark, N. J. 6
David John & Sons, 10 John, N. Y. 6
Detroit Copper and Brass Rolling Mills, Detroit, Mich. 6

Brass, Manufacturers of.

Holmes, Booth & Haydens, 49 Chambers, N. Y. 2
Plum & Astor, 31 2d St., New York, N. Y. 2
Rome Iron Works, Rome, N. Y. 2
South Mfg. Co., 21 Broome, N. Y. 2
Waterbury Brass Co., Waterbury, Conn. 2
Waterbury Mfg. Co., Waterbury, Conn. 2

Brass But Hinges.

Tibbitt W. & Co., 10 and 12 Chambers, N. Y. 24

Brass Foundries.

McFarland & Trenton, N. J. 4
Reeves Paul S., Philadelphia, Pa. 44
Reynolds Martin, Brooklyn, E. D., N. Y. 44

Bridge Builders.

Novelty Iron Works, Buffalo, N. Y. 29
Bridges Wm. & Co., Philadelphia, Pa. 27
Wiley & Russell Mfg. Co., Greenfield, Mass. 39

Bronze Bearings.

Am. Bronze Works, Cleveland, O. 41
Buckley Foundry and Machine Co., New York, N. Y. 41
Rowland T. F., Brooklyn, N. Y. 41

Builders' Hardware.

Clark Mfg. Co., Buffalo, N. Y. 43
Whipple Mfg. Co., Cleveland, O. 43

Butcher and Shoe Knives, Manufacturers of.

Wilson John, Sheffield, England. 10

Butts and Pins.

Stanley Works, New Britain, Conn. 33
Union Mfg. Co., 95 Chambers, N. Y. 7
Trenton Lock & Hardware Co., Trenton, N. J. 16
Whipple Mfg. Co., Cleveland, O. 43

Carriage Hardware.

Light & Sprague, 432 E. 10th, Philadelphia, Pa. 41
Smith H. D. & Co., Plantville, Conn. 12
The E. D. Clapp Mfg. Co., Auburn, N. Y. 8

Car Axles.

Roberts A. & P. & Co., 285 3d, Philadelphia, Pa. 25
Curtis - C. Spring Cart Co., Rushville, Ind. 25
DeWitts - C. Spring Cart Co., Indianapolis, Ind. 25
Yale Cart Co., New Haven, Conn. 25

Carpenter, Brass and Iron.

Whipple Mfg. Co., Cleveland, O. 43

Cast Iron.

Union Mfg. Co., 95 Chambers, N. Y. 7
Trenton Lock & Hardware Co., Trenton, N. J. 16
Whipple Mfg. Co., Cleveland, O. 43

Cast Iron.

Union Mfg. Co., 95 Chambers, N. Y. 7
Trenton Lock & Hardware Co., Trenton, N. J. 16
Whipple Mfg. Co., Cleveland, O. 43

Cupolas.

Smith & Sayre Mfg. Co., 345 Broadway, N. Y. 43

Cutlery, Importers of.

Baker Hermann & Co., 101 Duane, N. Y. 33
Clatworthy F. & W., 82 Chambers, N. Y. 33
Dane, Stoddard & Kendall, Boston, Mass. 33

Cutlery, Manufacturers of.

Bannister A. & Co., Newark, N. J. 41
John Russell Cutlery Co., Turners Falls, Mass. 41

Dog Collars.

Kodford Fanny Goods Co., 95 Duane, N. Y. 9

Dinner Pail and Lantern.

Haight Joseph, Port Chester, N. Y. 8

Door Hangers, House and Barn.

Moore S. H. & E. Y., Chicago, Ill. 35
Stevens E. C. & Co., Syracuse, N. Y. 44
Terry Mfg. Co., Danbury, N. Y. 29
Wilcox Mfg. Co., Aurora, Ill. 12

Drills.

Pope & Stevens, 114 Chambers, N. Y. 17

Drifting Machine.

Clark, Sims & Co., Springfield, O. 41

Duller Thos. H. & Co., Philadelphia, Pa.

Duller Thos. H. & Co., Philadelphia, Pa. 41

Drop Hammers.

Peckless Punch & Shear Co., 114 Liberty, N. Y. 39
Wiley & Russell Mfg. Co., Greenfield, Mass. 39

Drop Hammers.

Williams, White & Co., Moline, Ill. 44

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Drop Hammers.

Williams, White & Co., Moline, Ill. 44

Hose Reels.

Whelpley R. H., Chicago, Ill. 32

Holts, Portable.

Dunn J., Cleveland, Ohio. 11

Hooks, Cent and Flat.

Van Wagoner & Williams, 82 Beekman, N. Y. 44

Hooks, Cent and Flat.

Van Wagoner & Williams, 82 Beekman, N. Y. 44

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ESTABLISHED 1845.

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FIRE BRICK AND STOVE LININGS.

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Edge Pressed Furnace Blocks,
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Twenty years' practical Experience.

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Clay Gas Retorts and Retort Settings, and
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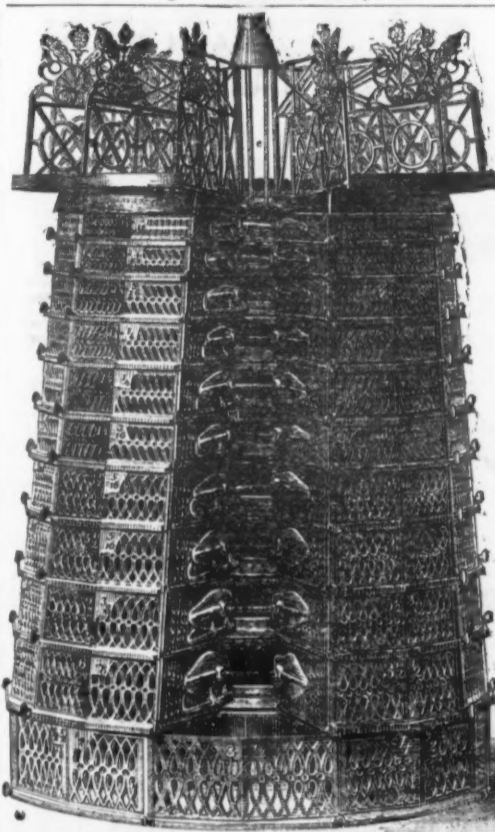
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For all goods of heavy weight, such
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be placed in Case, can be ordered at
my expense, and I will have them
stamped from Sheet Brass to fit Card
Rack of Case.
Height (exclusive of top ornament),
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Diameter (at bottom), 28 inches.
Diameter (at top), 21 inches.
Every Case is shipped at my risk,
and if not all I claim, can be returned
at my expense, and I will thank you.

We also Manu-
facture Screw and
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KEYSTONE SOCKET RAKE.



THIS IS THE ONLY SOCKET RAKE IN THE MARKET.
It is made and molded by a new process, and we know it is one of the strongest and best articles
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We make three sizes, 10, 12 and 14 teeth. Send for Catalogue and Price List.

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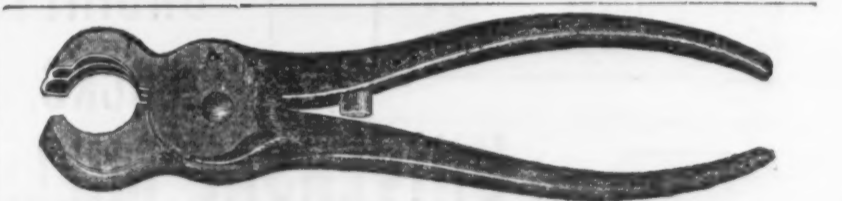
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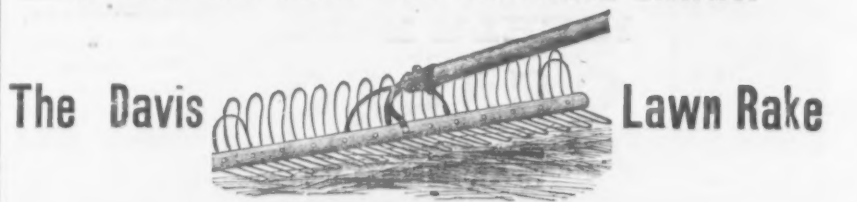
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A PERFECT RAKE FOR CLEANING LAWNS.



The teeth of this Rake are so formed that it is impossible to tear the grass or injure the lawn in
any manner. As a stable and general purpose Rake it is unequalled. No implement made so com-
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Seed Houses throughout the United States, England and Germany.

W. A. HALTEMAN & CO., Mfrs., Dayton, Ohio, U. S. A.

NEW YORK WHOLESALE PRICES, April 25, 1883.

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IRON.—Duty. Bars, 1 to 1/2 in. # 2 Sheet, Baco
Rods and Scroils, 1/4 to 1/2 in. # 2; provided that none
of the above iron shall pay a less rate of duty than
35 per cent. Pig, 2 1/2 in. # 2; Polished Sheet, 35 # 2;
Wrought Scrap, 25 # 2; Cast Scrap, 15 # 2; Iron
Rods, 20 # 2; Boiler and Plate, 15 # 2.

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Foundry, No. 12 # 2 ton 22.00
Gray Forge # 2 ton 19.50 @ 20.50

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Old Mills # 2 ton 31.00 @ 34.50
Old Mills # 2 ton 27.00 @ 27.50

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Common Iron # 2 to 1 in. round and square 27.00 @ 27.50
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Rods, 1/2 in. and 1/4 in. round and square. # 2 27.00 @ 27.50
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per 4 # 2 Manufactured (including all articles of
which Copper is a component or chief value), 45 # 2
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SHEATHING BRAZIER COPPER, Baco, &c.
Brazier, Copper, ordinary sizes, 10 # 2 per sq. ft.
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Copper in Copper. 10 # 2 per sq. ft.
10 # 2 per sq. ft. except 1 1/2 in. and not
to exceed 1 1/2 in. to the sq. ft.

TINNING. # 2 27.00 @ 27.50
All other size Sheets, 10 # 2 per sq. ft.
For tinning both sides, double the above amount.

O'KEL'S PATENT PLATED COPPER. # 2 27.00 @ 27.50
14 # 2 and 16 # 2, 10 # 2 per sq. ft. by the case, 10 # 2
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Boiler Plates. # 2 27.00 @ 27.50
14 # 2 and 16 # 2, 10 # 2 per sq. ft. by the case, 10 # 2
(And all sizes not over 10 in. wide.)

14 # 2 and 16 # 2, 10 # 2 per sq. ft. by the case, 10 # 2
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BRASS. # 2 27.00 @ 27.50
Brown & Sharp's Gauge the Standard for Metals.
Old English Gauge the Standard for Wire.

BRASS MANUFACTURERS' PRICE LIST. # 2 27.00 @ 27.50
Cash prices for Roll and Sheet Brass. For less quantities
than 100 # 2 add 1 # 2.

IRON BRASS. # 2 27.00 @ 27.50
All Nos. not thinner than 1/2 in., wider than 2 in.,
not wider than 12 in., 10 # 2 per sq. ft.

IRON BRASS. # 2 27.00 @ 27.50
All Nos. to No. 28 inclusive, and widths over 20 to 30
in., inclusive, 10 # 2 per sq. ft.

IRON BRASS. # 2 27.00 @ 27.50
All Nos. to No. 28 inclusive, and widths over 20 to 30
in., inclusive, 10 # 2 per sq. ft.

IRON BRASS. # 2 27.00 @ 27.50
All Nos. to No. 28 inclusive, and widths over 20 to 30
in., inclusive, 10 # 2 per sq. ft.

IRON BRASS. # 2 27.00 @ 27.50
All Nos. to No. 28 inclusive, and widths over 20 to 30
in., inclusive, 10 # 2 per sq. ft.

IRON BRASS. # 2 27.00 @ 27.50
All Nos. to No. 28 inclusive, and widths over 20 to 30
in., inclusive, 10 # 2 per sq. ft.

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All Nos. to No. 28 inclusive, and widths over 20 to 30
in., inclusive, 10 # 2 per sq. ft.

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All Nos. to No. 28 inclusive, and widths over 20 to 30
in., inclusive, 10 # 2 per sq. ft.

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All Nos. to No. 28 inclusive, and widths over 20 to 30
in., inclusive, 10 # 2 per sq. ft.

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IRON BRASS. # 2 27.00 @ 27.50
All Nos. to No. 28 inclusive, and widths over 20 to 30
in., inclusive, 10 # 2 per sq. ft.

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All Mandrel Drawn Tubes under 1/2 in. 25 cents per
pound advance.

IRON TUBING.—dis. 2 1/2 in. # 2 27.00 @ 27.50
Plain # 2 27.00 @ 27.50
Fancy # 2 27.00 @ 27.50
Scotch and Extra Patterns # 2 27.00 @ 27.50

STEEL.—Duty. Bars, Ingots, Sheets and Coils.
value at 70 # 2 or under, 1/2 in. over 70 and not
above 11, 30 # 2; over 11, 35 # 2; and 10 # 2 ad val.
Railway Bars, 1/2 in. # 2. Railway Bars, in part Steel,
10 # 2. Provided that Mandrel drawn, cast or rolled
from iron by the Bessemer or pneumatic process, of
whatever form or description, shall be classed as
American Cast Steel.

**For American Steel see quotations under heading of
Pittsburgh.**

English Steel. # 2 27.00 @ 27.50
Best Cast # 2 27.00 @ 27.50
Extra Cast # 2 27.00 @ 27.50
Circular Saw Plates # 2 27.00 @ 27.50
Round Machinery Cast # 2 27.00 @ 27.50
Swaged Cast # 2 27.00 @ 27.50
Best Double Shear # 2 27.00 @ 27.50
Blister, no quality # 2 27.00 @ 27.50
German Steel, Best # 2 27.00 @ 27.50
ad quality # 2 27.00 @ 27.50
ad quality # 2 27.00 @ 27.50
ad quality # 2 27.00 @ 27.50

ANTIMONY. # 2 27.00 @ 27.50
See Trade Report

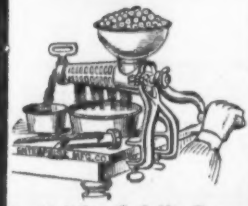

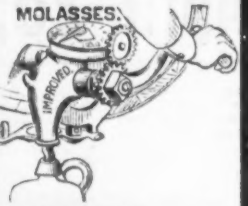
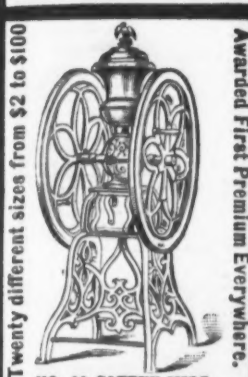


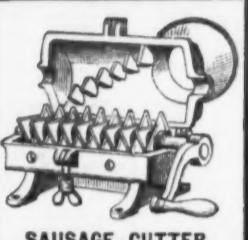
LEAD.—Duty. Pig, 2 1/2 in. # 2 27.00 @ 27.50
Pipe and Sheet, 2 1/2 in. # 2 27.00 @ 27.50
American # 2 27.00 @ 27.50
Bar # 2 27.00 @ 27.50
Pipe # 2 27.00 @ 27.50
Tin Lined Pipe # 2 27.00 @ 27.50
Sheet # 2 27.00 @ 27.50
Shot # 2 27.00 @ 27.50
Chilled Shot # 2 27.00 @ 27.50

BARRETT. # 2 27.00 @ 27.50
N. P. U. # 2 27.00 @ 27.50
A. B. C. # 2 27.00 @ 27.50

TIN.—Duty. Plates, Sheets, Tagger and Terms, 1/2 in.
ad val. Electric Plate, 2 1/2 in. # 2 27.00 @ 27.50
Manufactures of, not enumerated, 35 per cent. ad val. Bar,
Block and Pig free. Banca, subject to duty of 10
per cent.

Banco. # 2 27.00 @ 27.50
Strait # 2 27.00 @ 27.50
English # 2 27.00 @ 27.50

TIN PLATE. # 2 27.00 @ 27.50
IC 10214 Prime Charcoal # 2 27.00 @ 27.50
IC 10215 Prime Charcoal # 2 27.00 @ 27.50
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 Fruit, Wine & Jelly Press.	 SAUSAGE STUFFER.	 MOLASSES. Self-Measuring Faucet.
 Twenty different sizes from \$2 to \$100. Awarded First Premium Everywhere. NO. 20 COFFEE MILL.	 Tincture Presses, Self-Weighing Cheese Knife, Cork Presses. THE BEST ARE THE CHEAPEST. MRS. POTTS' Cold Handle Double Pointed Sad Irons. SOLD BY HARDWARE DEALERS. SEND FOR ILLUSTRATED CATALOGUE, FREE.	
	 Smoked Beef Shaver.	 SAUSAGE CUTTER.

THE STANLEY WORKS,
MANUFACTURERS OF
Wrought Iron Butts, Hinges
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DOOR BOLTS,
Plain, Japanned, Bronzed and Plated.
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IRON AND STEEL
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For Fire Arms, Saw and Wind Mills, Engine, Tool and Machine parts of all kinds. Railroad and Marine Work. Agricultural Implements and Machinery, Carriage and Wagon Irons, Electrical and other Apparatus.

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PATENT COMBINATION WRENCH.
These Wrenches are made from the best of Wrought Iron, with Steel Head and Jaw, case-hardened throughout, and not only combine all of the superior qualities of our Cylinder or Gas Pipe Wrenches, but also all requisite combinations of a regular Nut Wrench thus making a combination which has no equal.

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TUBULAR FRAME GARDEN & RAILROAD BARROWS.
With patent steel and iron wheels. Handles and wheels shipped in bundles. Woodwork in crates at lowest rates of freight. The Barrows are easy to set up, and are the lightest, strongest and best Barrows in the World.
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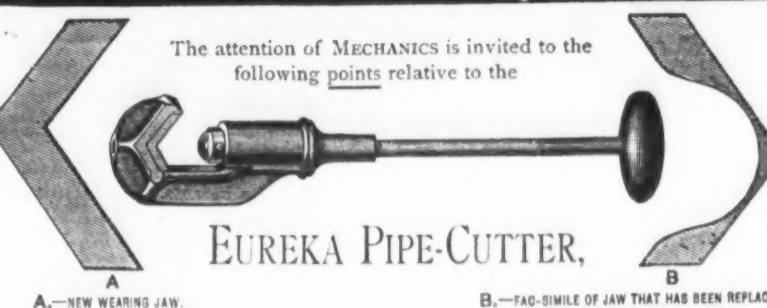
Henderson's Patent Refractory Compounds.
THE SILICA BRICK OR COMPOUND.
This compound is adapted to all uses to which silica and fire-clay brick are used. Its advantages are: Production below cost of common red brick for labor and materials; neither expands nor contracts from molding to highest temperature. Infusibility at any temperatures used in the arts. Self-baking or burned in the use. Can be made in any locality where sand is obtainable. No outlay of capital for apparatus. Made by unskilled labor at place where used. May be used in bulk by ramming behind a core, or molded into brick. Repairs are made by patching the fire-worn surface with the same compound. Is adapted for molding steel castings.

THE LIME OR MAGNESIAN LIME COMPOUND.
This possesses all of the above advantages, with the addition of being better adapted for silver and lead smelting furnaces, iron and steel converting furnaces, and other uses where greater wear or chemical changes are produced by use of silica, and of being made in localities where sand is not obtainable, and of being below cost of red brick for labor and material.

For particulars as to manufacture and licenses, apply to
JAMES HENDERSON, Agent, Bellefonte, Centre Co., Penn.

The "Eureka" Pipe Cutter

The attention of MECHANICS is invited to the following points relative to the


A.—NEW WEARING JAW. B.—FAD-SIMILE OF JAW THAT HAS BEEN REPLACED AFTER MONTHS OF CONSTANT SERVICE.

EUREKA PIPE-CUTTER,

Which constitute two of its strongest claims, as being the most economical tool of its class they can invest in.

When the ordinary Solid Frame Pipe-Cutters are worn into a deep groove they will no longer cut the smaller sizes of Pipe, and must either be replaced with an entire new tool or repaired by a blacksmith, at a considerable expense. In the EUREKA, the insertion of a new jaw, A, makes it as good as a new Cutter, and, consequently, this tool, at a slight expense for Jaws, from time to time, will last for years.

The New Model, No. 1, cuts 1/4 to 1 inch Pipe, and the No. 3 cuts 1 to 3 inch; consequently, these two TOOLS will do the same work as all three sizes of the ordinary Wheel Cutters.

PANCOAST & MAULE,
243-245 South Third Street, Philadelphia.

MELLERT FOUNDRY & MACHINE CO., LIMITED.
(Works Established at Reading, Pa., in 1848.)
MANUFACTURERS OF

CAST IRON GAS & WATER PIPE

Also Flange Pipe, for Steam or Water, of all sizes used. Special Castings, such as Branches, Bends, Reducers, Sleeves, &c. Stop Valves, Fire Hydrants, Retorts, Lamp Posts, &c.

The Improved Canada Turbine Water Wheel.
MACHINERY AND CASTINGS FOR
Furnaces, Rolling Mills, Mining Pumps, Hoists, &c.
GAR CASTINGS, GIRDERS, COLUMNS, BRACKETS, IRON RAILING, &c., &c.
GENERAL OFFICE AT READING, PA.


ROOF CRESTING AND FINIALS,
Weather Vanes, Tower Ornaments, &c.
WROUGHT IRON FENCES,
Iron Shutters, Window Guards, Jail Work, &c.,
BANK AND OFFICE RAILINGS,
WIRE and IRON WORK of Every Description.
THE E. T. BARNUM WIRE & IRON WORKS,
Detroit, Mich., U. S. A.

Armstrong's Improved Adjustable Stock and Dies
FOR PIPE AND BOLTS.


Tapped to the U. S. and Whitworth Standard gauges. Adjustable to all variations in the size of fittings. Can be sharpened without drawing the temper by simply grinding them. Possessing practical advantages appreciated by all mechanics. Circular and Price List sent free on application.

Manufactured by **F. ARMSTRONG, 30 Sterling St. Bridgeport, Conn.**


PRENTISS' PAT. VISES,
Adjustable Jaw.
Stationary or Pat. Swivel Bottoms.
ADAPTED TO ALL KINDS OF VISE WORK. ALSO
"PEE-LESS" SWIVEL PIPE GRIP
FITS ANY VISE. SOLD BY THE TRADE.
PRENTISS VISE CO.,
93 Dry Street, New York.
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BROWN'S HOG AND PIG RINGER and RINGS.
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The great demand for and rapid increase in the popularity of the PERFECTION WINDOW CLEANER has influenced unprincipled parties to offer for sale an inferior and worthless imitation. We therefore caution all such persons and the trade generally against the manufacture, sale or use of any RUBBER WINDOW CLEANER not bearing our stamp, as all others are infringements, against which we shall protect ourselves under the rights granted us in U. S. Patents to the full extent of the law.

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This rod is round and made in two sections; is united by a solid screw joint, as if of one length, and has a target. There are two scales, one side being Engineers' (feet, inches and sixths) the other Architects' scale (or, feet, inches and sixths). Price, \$6.

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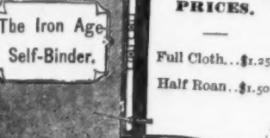
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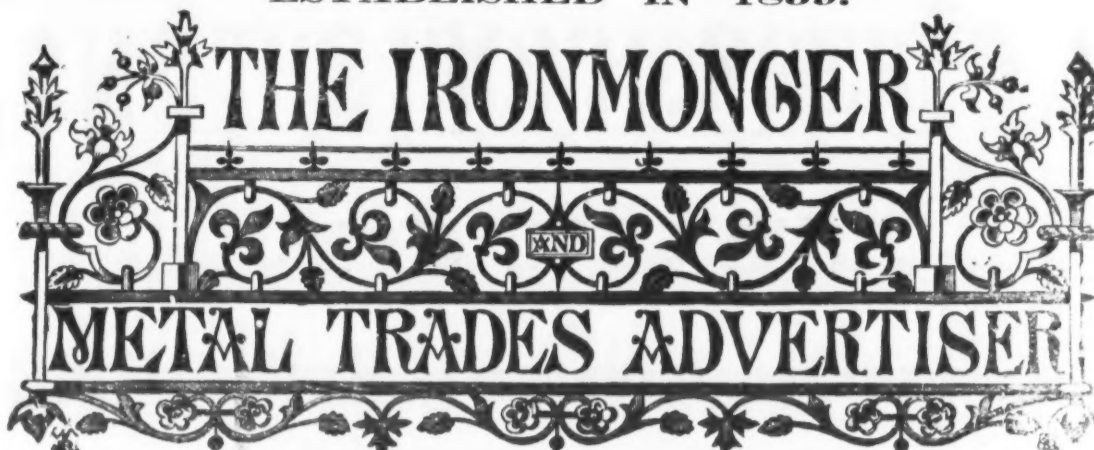
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THE IRONMONGERS' DIARY AND TEXT BOOK.This is an annual, presented free to every Subscriber to the *IRONMONGER AND METAL TRADES' ADVERTISER*. It contains a large number of ruled skeleton pages for diary and other entries, and in addition much useful reference information, varied from year to year. It is handsomely bound in cloth, gilt; and as copies are used in thousands of establishments for a whole year, it is obviously a medium of exceptional value for advertisements. Sold to non-subscribers at 75 cents.**THE FOREIGN SUPPLEMENT,**

With which is incorporated The Universal Engineer,

is published every fourth week in connection with the extensive and world-wide circulation of the *Ironmonger* itself. The dates of its publication for the next twelve months will be as follows:

APRIL 28, MAY 26, JUNE 23, JULY 21, AUGUST 18, SEPTEMBER 15, OCTOBER 13, NOVEMBER 10, DECEMBER 8 1883, JANUARY 5, 1884.

FEBRUARY 2, and MARCH 1, 1884.

This supplement is published in

FOUR LEADING COMMERCIAL LANGUAGESof the world, including English, and is sent to all the countries where they are spoken, thus placing the contents of the *Ironmonger* not only with reach, but in the native language of eighty millions of German, twenty-eight millions of Italian, and fifty-one millions of Spanish speaking people; or, all, over two hundred millions of inhabitants in the principal nations where the best purchasers of manufactured goods are to be found.

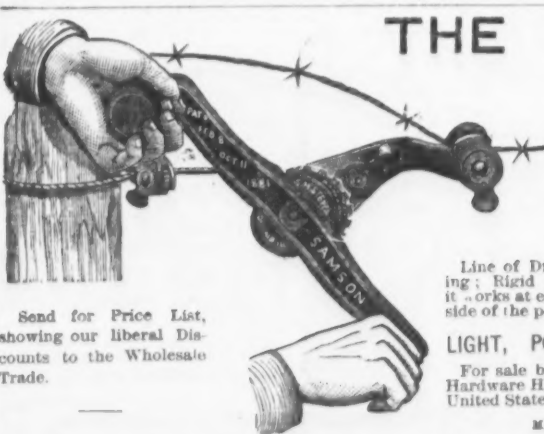
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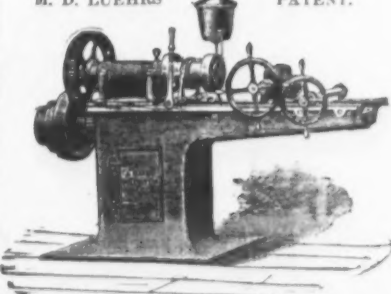
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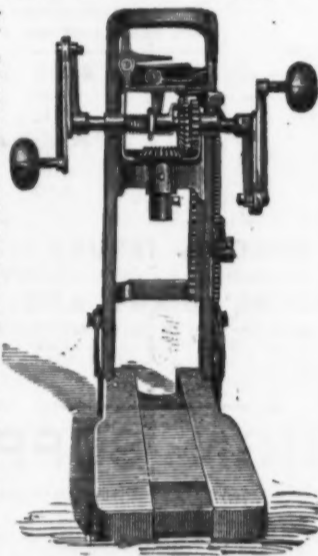
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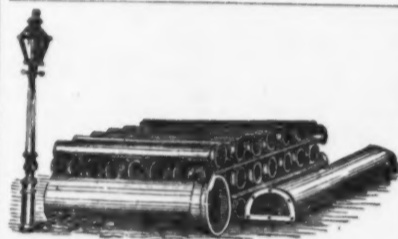
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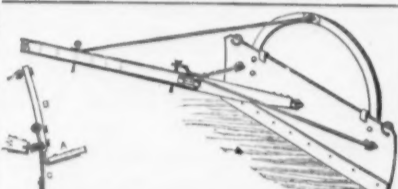


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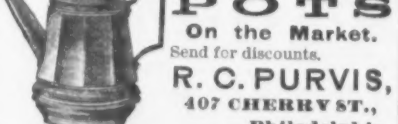


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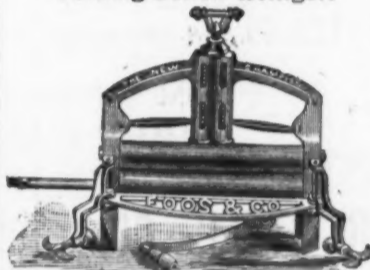
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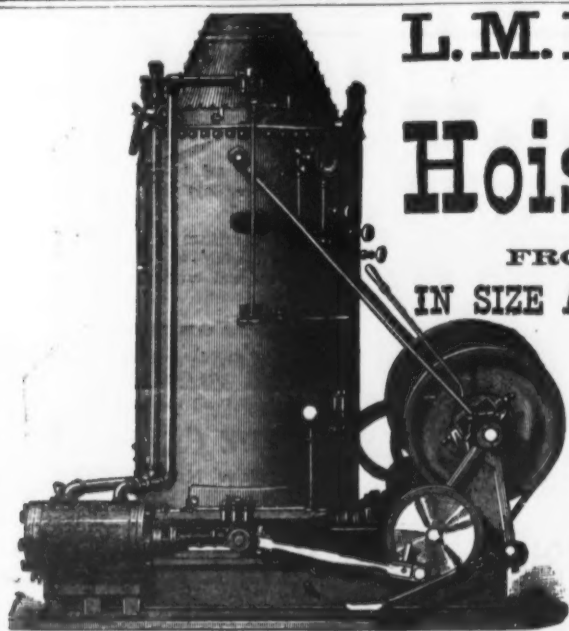
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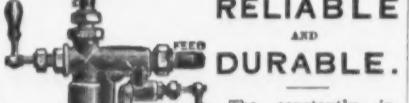
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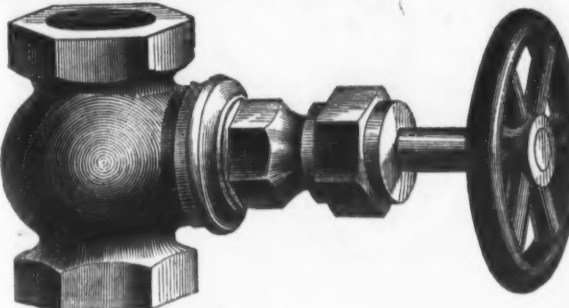
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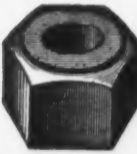


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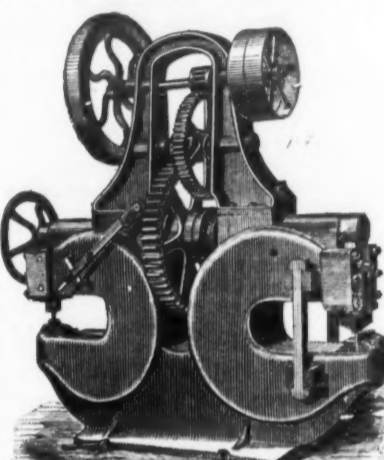
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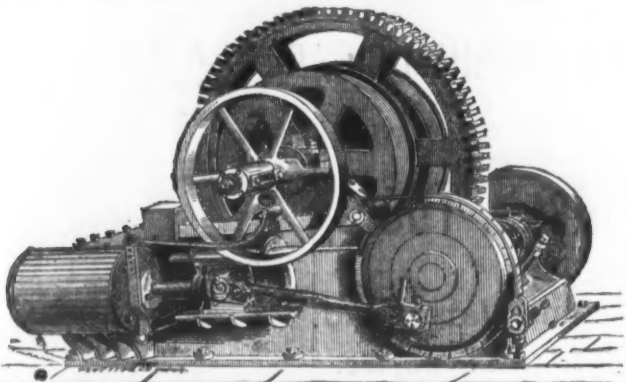


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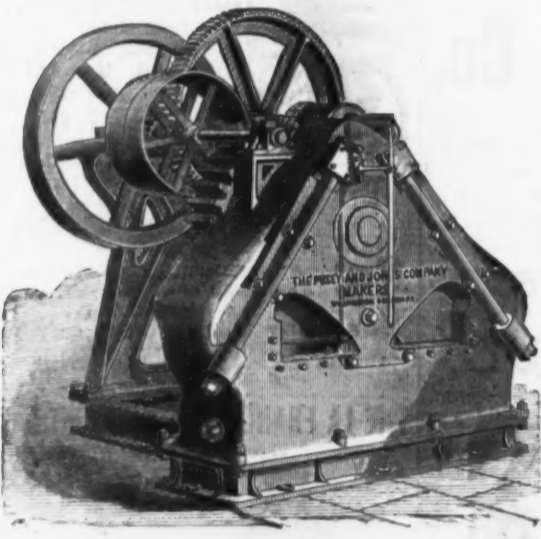
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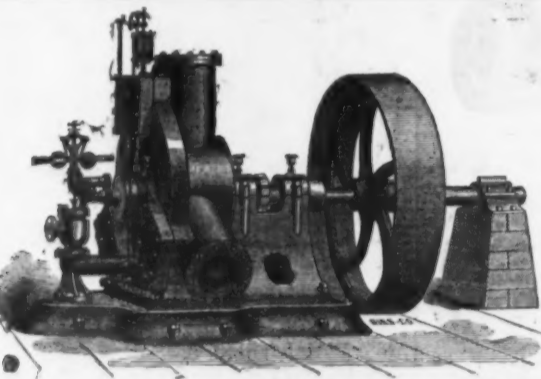
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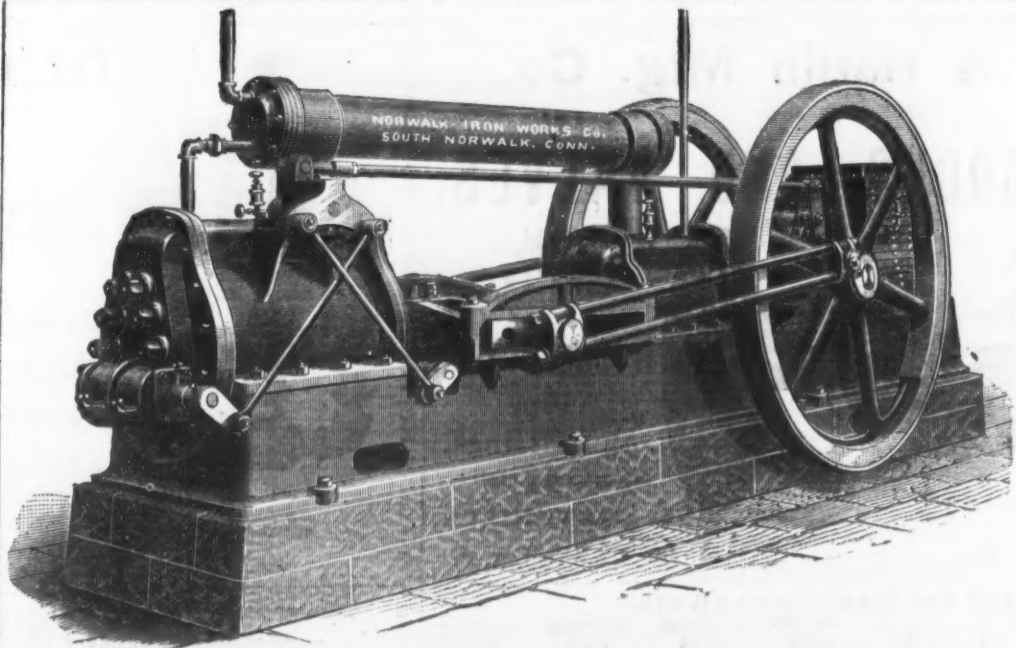
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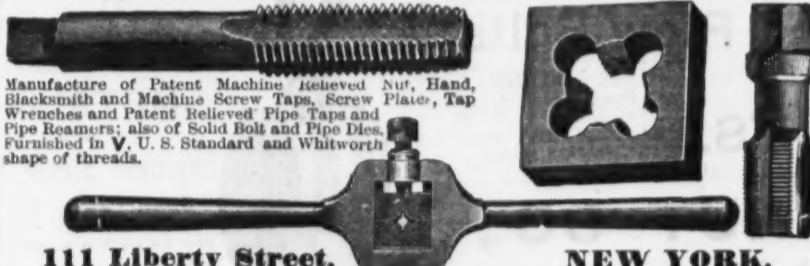
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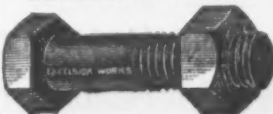
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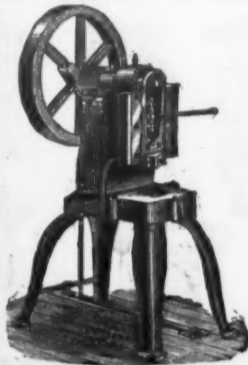
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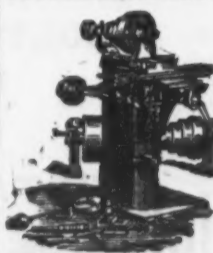
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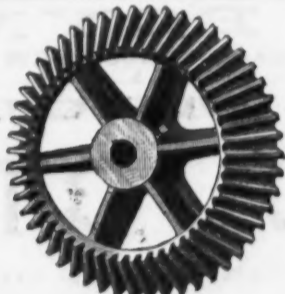
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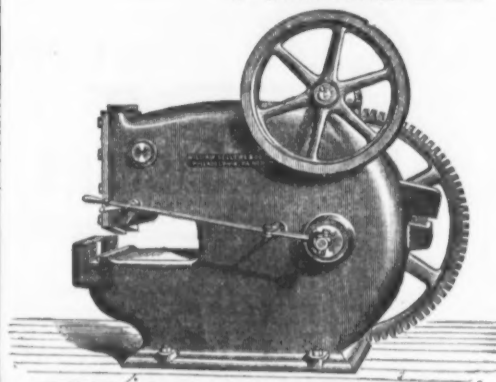
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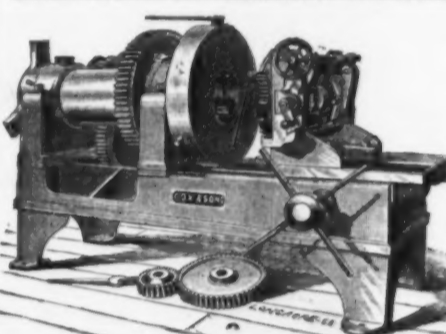
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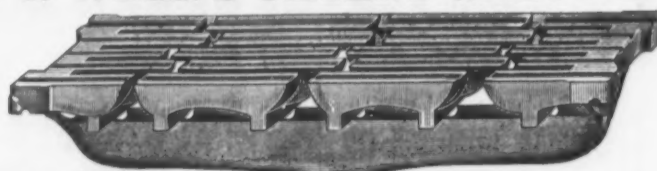
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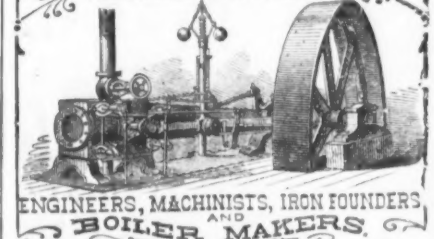
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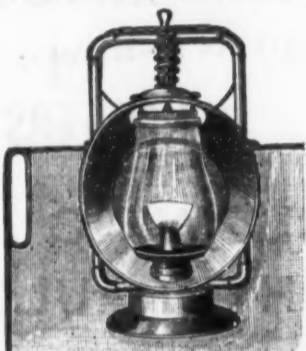
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